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SEPTEMBER, 1944

The TOOL ENGINEER

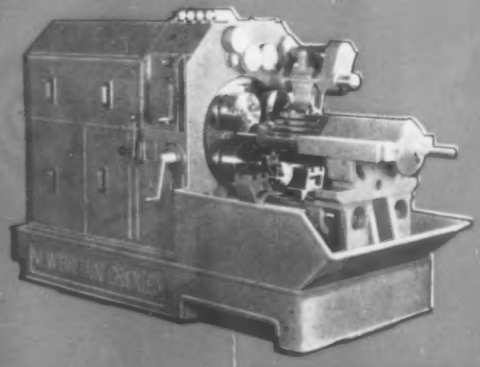
Official Publication of American Society of Tool Engineers

WHERE YOU SEE THIS NAME...

NEW BRITAIN

...YOU'LL SEE PRODUCTION

New Britain builds a complete line of multiple spindle screw machines to 2¼" capacity. Also a complete line of chucking machines . . . four, six and eight spindles up to 10¼" capacity.



NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

PUBLISHED BY THE BRAMSON PUBLISHING COMPANY

This Pratt & Whitney Air-O-Limit Internal Comparator avoids actual contact . . . eliminates danger of scratches or marrings of fine finished surfaces . . . gives instant, accurate readings that split "tenths" . . . speeds up I.D. inspection rate.

• • •

It was a tough problem. An airplane engine manufacturer needed a safe, sure way to inspect the critical I.D. of master-rod bearings. Ordinary gaging methods would touch the soft lead-indium plated inner surface . . . produce scratches that would spoil it for use.

The manufacturer asked Pratt & Whitney engineers, "Have you the answer?"

"No, but we'll find one." Result: the Air-O-Limit Internal Comparator . . . extremely simple in construction and operation . . . but it took the accumulated years of P&W "know-how" and experience and skill to produce it quickly.

Here's how it works. The bearing to be inspected is placed on a sliding V-block mounting and slipped over the gaging spindle . . . there is a slight clearance so that *it does not actually touch.* This spindle has two tiny opposite nozzles through which compressed air is forced. The amount of back pressure caused by limiting the discharge of air through the nozzles is registered on a precision pressure indicator calibrated to read in ten-thousandths of an inch. Size, roundness, and taper are unerringly recorded.

This is the highly successful Air-O-Limit Bearing Gage. Other Air-O-Limit models use the same "air principle" but omit the non-touching feature. The piece slips on the spindle and rests on a chrome-plated surface. Hundreds of this type are at work inspecting fine tolerance parts. They require practically no upkeep or servicing . . . are designed for long wear.

One more typical Pratt & Whitney contribution to the speeding up of America's mighty war production . . . one more contribution to peacetime mass production. Ask for information.

PRATT & WHITNEY

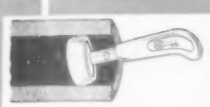
Division Niles-Bement-Pond Company

WEST HARTFORD, CONNECTICUT, U. S. A.

STANDARD

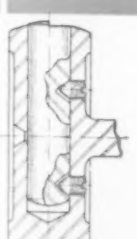
TeBo Gages

NOW produced in America for American Industry



ONE OPERATION
Checks Minimum and Maximum Tolerances

REVEALS BORE CONDITION AT ANY POINT



ADJUSTABLE FOR CHANGE OF TOLERANCES

Check Bores in ONE Operation More Accurately, 60% Faster Than Conventional Type Plug Gages

TeBo GAGES, long the favorite bore checking instruments of Swedish and other European precision workers, are now produced by Standard Gage Company. Considered by users the most desirable fixed limit type gage, TeBo can make a tremendous contribution to precision in American mass production. It performs, in *one* operation, the several functions required of plug gages, with an ease and accuracy that is a revelation to expert craftsmen.

With TeBo Gages, both minimum and maximum limits may be checked in *one* operation. They reveal the internal conditions of the bore at any point, indicating such factors as out-of-round, taper, belling, as well as dimensional deviations. They can be used with equal accuracy in soft as well as hard metals. May be used in thin walled bores without risk of distortion.

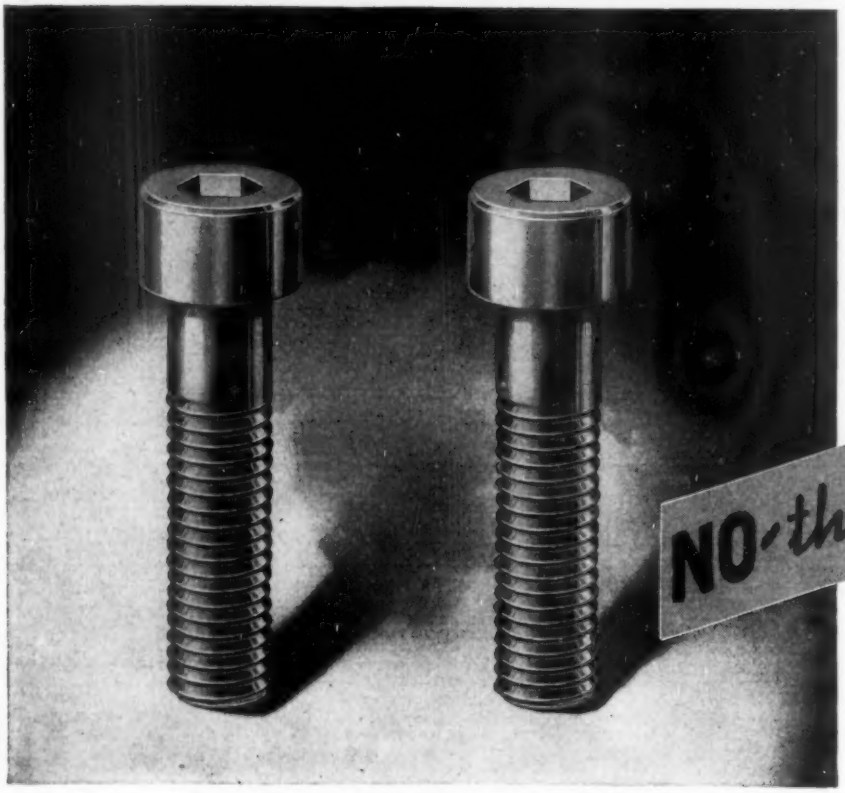
The chromium plated TeBo Gage head is a section of a true sphere, the ideal shape for internal gaging. It passes through a bore freely, without jamming or forcing. A spherical projection controls maximum tolerance measurements. Standard Gage has added adjustability to this projection by means of two ingenious set screws.

TeBo Gages are light in weight and precisely balanced. They minimize fatigue and may be used over long periods without strain. Their operation is so simple and direct and their findings so easily understood that major gaging operations may be entrusted to workers of slight technical skill. Users report savings up to 60% in gaging time through use of TeBo Gages.

WRITE FOR NEW TeBo GAGE BOOKLET

ARMY E NAVY

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.



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√fibro forged
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SCREWS

√ Method Patented, Owned, Controlled and Used Solely by HOLO-KROME

by HOLO-KROME

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VOLUME XIV SEPTEMBER, 1944 NUMBER 3

THE TOOL ENGINEER

T.M. REG. BY AMERICAN SOCIETY TOOL ENGINEERS

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Publisher's Letter

INCREASINGLY encouraging news from war theaters prompts industrialists to think in terms of prewar business practices. Already the air is filled with tensions of reconversion, competition, advantages.

Admittedly, such thinking built an American industrial empire. Still, there are advantages in a united industrial front. Where once fear made bed-fellows of one-time cut-throat competitors, surely the peace to come should be met just as unitedly.

Exigencies of war will dictate industrial teamwork for some months to come. Sound reasoning should compel its adoption as a business principle.

Elsewhere in this issue is a lively article on standards of craftsmanship. Is this not a good example of cooperation? Why should industries compete over nonessentials, using up in waste friction American ingenuity that might better be employed on the obvious and thus far unsolvable problems of manufacturing?

Beyond the boundaries of the United States there is a world in ruins, destitute even of the tools to provide. Urgent needs of these torn nations represent a potential market beyond the wildest dreams of a duPont or a Ford.

Supplying those needs will mean ability to sell quality at a fair price —a price that will be attractive in world commerce. America has achieved industrial independence. The problem is to capitalize on that independence.

To return to our discussion of standards, more widespread adoption might well present a uniformity of product specifications that would offset unhealthy aspects of international competition.

Industrial standards are but one area of agreement in American industry. This war has meant dissemination of fundamental "know how", exchange of basic information. Companies, without loss of originality, have traded men and materials.

Such wide-spread exchanges may not be needed in a world at peace, but in a limited sphere there could be some trading to eliminate duplication of research, waste of talent, destruction of materials.

The practice of competitors in putting their feet under a common table to squarely face issues has been a wholesome procedure, one tending to inspire public confidence in the once odious "Big Business". Many peacetime problems could be met in this manner without collusion, restraint of trade or loss of individual initiative.

Your own experiences, rich in war-dictated emergencies, will suggest other industrial areas of agreement.

Our industrial 'varsity team defeated regimented herrenvolk in war and I am convinced it can score heavily in the peace.

Cordially yours,

Roy T. Bramson

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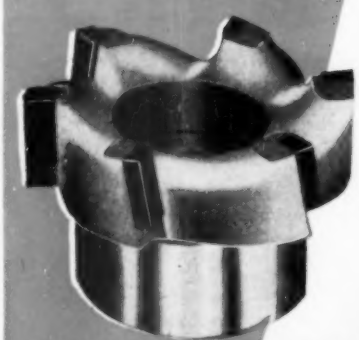
HERE'S PROOF OF

Super Performance!

If you want proof of the time-saving and money-saving performance of Super Carbide Tipped Milling Cutters, look at the production records on jobs where these tools are at work. There you will find Super Milling Cutters setting new standards for speed, accuracy and quality of work. You'll find them saving production costs in many ways . increasing table feeds, running longer between grinds, reducing machine down time and providing much longer tool life than other types of milling cutters. For example:

On one job where aluminum castings were being milled, the high speed steel cutter formerly used ran at a speed of 600 RPM with a table feed of 5" per minute. This cutter ran four hours between grinds. When a Super 6-Tooth Carbide Tipped Cutter (such as shown at the left) was put on the job, the RPM's were stepped up to 1500, the table feed was increased to 20" per minute, and the Super Cutter ran one week between grinds. An additional saving was made because the Super Cutter ran dry while it was necessary to run the high speed steel cutter wet.



On another job where lugs on a diesel engine crankshaft were being faced off, a 4" Super Carbide Tipped Shell End Mill (such as shown at left) replaced a high speed steel cutter with the following results: RPM's were stepped up from 90 to 545. Table feed was increased from 1⅛" per minute to 12½" per minute. And crankshafts per grind were increased from 4 to 25. On this job the length of the cut was 6", the depth 3/16" and the width 1½". Additional savings were made because the Super Cutter ran dry while the HSS cutter ran wet.

You, too, can get savings like these! Just specify Super Carbide Tipped Cutters on your milling jobs!

WRITE TODAY FOR THIS LITERATURE

Descriptions, illustrations, prices and complete details of Super Carbide Tipped Tools for turning, facing, reaming, spot-facing, forming, grinder rests, wear parts, boring, drilling, grooving, counterboring, shaving, centers and special purposes are given in a series of folders. One or all of these folders will be sent to you upon request. Write today.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

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Tracer-Controlled MILLING

8 mm. movie camera case profiled in large quantities

TRACER CONTROL Proven FASTER METHOD FOR HIGH PRODUCTION PROFILING

High Accuracy and Finer Finish Maintained . . . Production Doubled

An American camera manufacturer found the Gorton Duplicator the ideal machine for high production profiling of both seat for cover and film tract clearance of camera cases, holding tolerances of ±.003". Gorton high spindle speeds produced the required fine finish.

SIMPLE HEAT-TREATED MASTER determines cutter path. For high production, pneumatic clamping provides easy loading and unloading and simultaneously regulates flow of coolant.

On jobs like this, the Gorton Duplicator permits any reasonably good operator to perform satisfactory work, maintaining high accuracy, comparable to results of highly skilled mechanics on special production equipment.

PRODUCTION DATA

Operation—Profiling to fine finish.
Material—Aluminum alloy.
Speed—4,000 r.p.m.
Feed—Manual.
Production—30 per hour.
Previous Method—15 per hour.

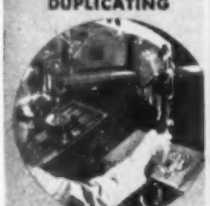
GORTON ENGINEERING SERVICE, FREE

Investigate the possibilities of the Gorton Duplicator as the practical, economical solution to your high production profiling problems. Gorton engineers who have specialized for 50 years in the development of tracer-controlled milling will give you their recommendations without obligation. Submit part, prints or specifications to your Gorton dealer, or Factory at Racine, Wis.

The *Right* Size The *Right* Type of Machine for Every Job . . .
From 2 oz. to 2 ton DIE BLOCKS

Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING



Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON ARMY-NAVY E

GORTON *Precision* MACHINES

ETCHING MACHINES
2 & 3 Dimensional PANTOGRAPHS
Vertical & Universal Head Super-Speed MILLERS
Manual & Electric Control DUPLICATORS

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Steve is in there "plugging" for you —still

BACK in pre-induction days when he was working for your Industrial Supply Distributor ◆Steve kept plugging to find the things you had to have to keep your war output moving on decent schedule.

You didn't see Steve very often—but you profited by his help every day. He knew of sources for the materials you had to have —and he spent hours on end running them down by 'phone. He was plugging for you then and he is in there plugging for you still.

Today your Industrial Distributor's man-supply is reduced too, but he is organized to help you shortcut a lot of your routine. He can purchase everything that you and many other large users require, on a single shipment from the factory—can draw on stock for deliveries to you as needed.

Take him into your planning. Today and *every* day—

Telephone your ◆I◆S◆C◆ FIRST!

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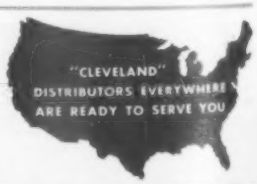
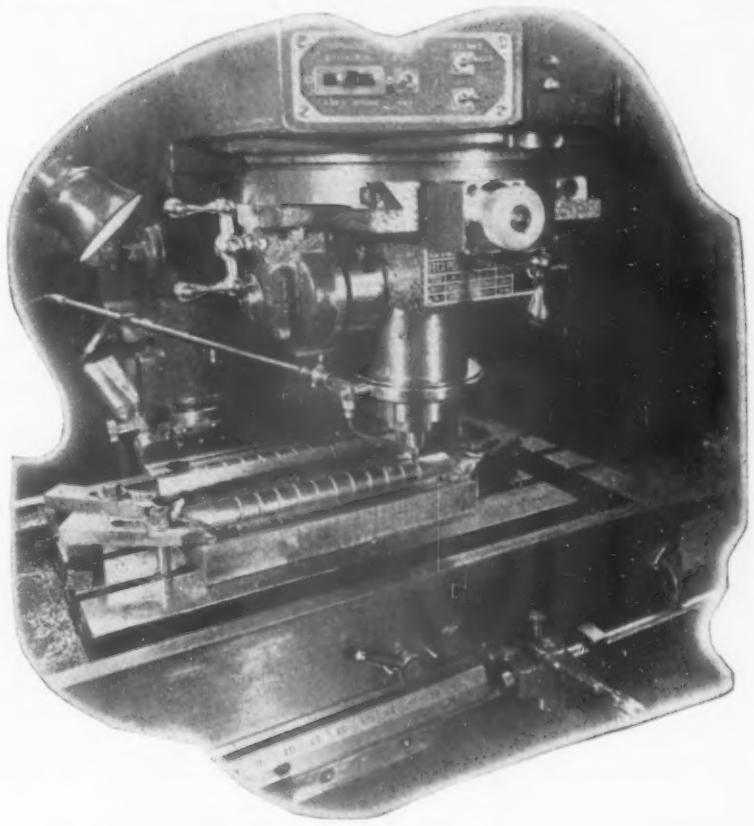
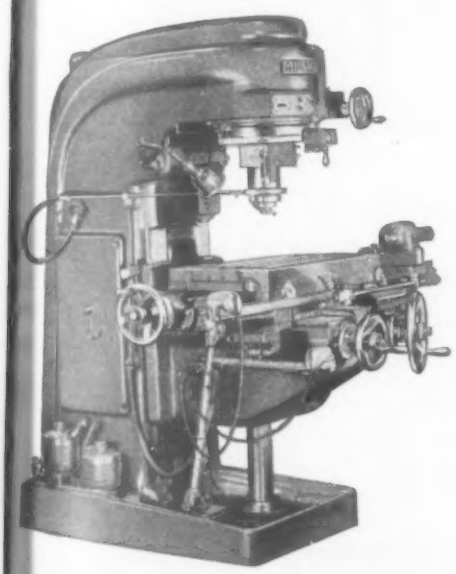


ROTARY HEAD MILLER . . . PLUS CHERRYING ATTACHMENT . . . SIMPLIFIES THIS "*TRICKY*" MILLING OPERATION

The Milwaukee Rotary Head Miller equipped with a cherrying attachment made "short work" of the "*tricky*" milling required on this injection mold. It took just two hours to complete the job — far less time than by any other method known.

The cherrying attachment is an auxiliary rotary head, mounted at 90° to the head of the miller. It is used to mill circles and angles in a vertical plane. When used with rotary head motion, spherical and conical cavities can be accurately and rapidly milled — in almost all cases difficult operations become a comparatively simple task.





KEARNEY & TRECKER'S ROTARY HEAD MILLER

The Most Versatile Machine Ever Designed for Mold and Die Work

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements —possible only with this machine— transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C for complete information on the Milwaukee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies.

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

SEVERANCE MIDGET MILLING CUTTERS

WITH 1/8" SHANKS

Available singly or in sets of 10 shapes

For extremely fine work with portable power tools . . .

Now to the standard line of Severance cutting tools has been added Midget Milling Cutters with 1/8" shanks for especially fine precision work. These efficient, long-wearing, quick-cutting little tools have all the qualities of their big brothers in the Severance line. They cut sharp chips into the toughest metal, wood or plastic without chatter. They do a top-notch job of finishing on the most intricate patterns or parts. Available in ten standard shapes, singly or in sets of ten in an attractive, handy, colorful box that keeps them in neat order at all times.

If your production calls for fine finishing of small parts or hard-to-get-at surfaces, you will find the new Severance Cutters with 1/8 inch shanks the ideal tools. Order a trial set for immediate delivery.

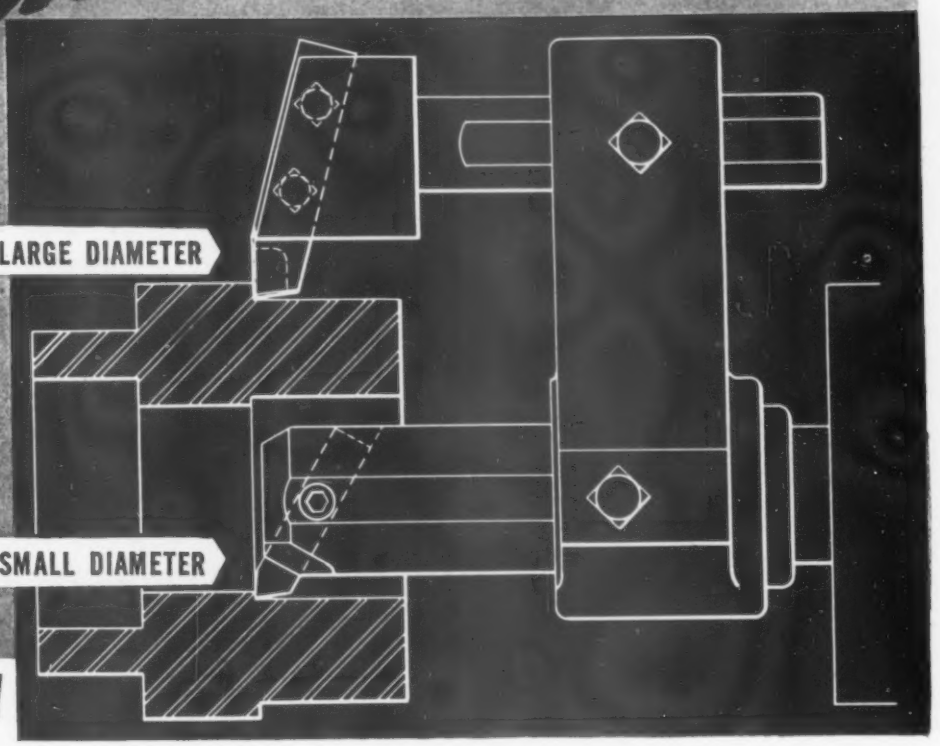
Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN • PLANTS IN LONG ISLAND CITY 1, NEW YORK; DETROIT 2, MICHIGAN; FORT WAYNE 8, INDIANA; CHICAGO 6, ILLINOIS AND LOS ANGELES 21, CALIFORNIA. IN CANADA: 60 FRONT STREET WEST, TORONTO, ONTARIO.

Teamwork

RAMET
TANTALUM
TUNGSTEN
CARBIDE FOR THE LARGE DIAMETER

TANTUNG FOR THE SMALL DIAMETER



-on a Turning and Boring Operation

A typical set-up on a W. & S. turret lathe showing Vascoloy-Ramet Tantalum-Tungsten Carbide and Tantung being "teamed together". Boring and turning operations are done simultaneously.

Technical Data:

R.P.M.	272
S.F.M. in O.D.	320
S.F.M. in I.D.	160

Depth of cut ⅛ inch with .012 feed. Material being cut S.A.E. 1020 steel.

An example of an efficient machine operation teaming Vascoloy-Ramet Tantalum-Tungsten Carbide with Tantung. At 272 R.P.M., the Large Diameter is being machined at the rate of 320 S.F.M., the Small Diameter at the rate of 160 S.F.M.

It is obvious that the Carbide tool has to take the burden of the high perepheral speed. The Small Diameter at 160 S.F.M. is too slow for Carbide and too high for efficient use of a High Speed Steel tool. Tantung filled the gap by replacing High Speed Steel and production skyrocketed. This principle of "Teaming-Up" Tantung with Carbide can be applied to innumerable operations.

Turning gear blanks with smaller diameter hubs and where the diameters vary, is one example where Tantung-Carbide Teamwork pays dividends. Use Tantung when you can't use Carbide.

Ramet

VASCOLOY RAMET CORPORATION

NORTH CHICAGO • ILLINOIS • SALES & SERVICE IN PRINCIPAL CITIES

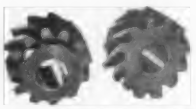
4465

Typical Jobs

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Compressor Yoke. Alignment maintained and better finish produced.

Mild Steel Clevis. Honing corrected errors of previous operations and maintained true alignment of two holes.



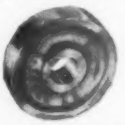
Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Aluminum Aircraft Link produces high finish without bell-mouthing.

Bearing. A very small part. 2 micro-inch finish necessary.

Shell Loading Die.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.



Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Airplane Engine Parts accurately honed to a super-smooth finish.

Idle Valve Guide. Honing after grinding holds a .0002" limit necessary for accurate idling.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

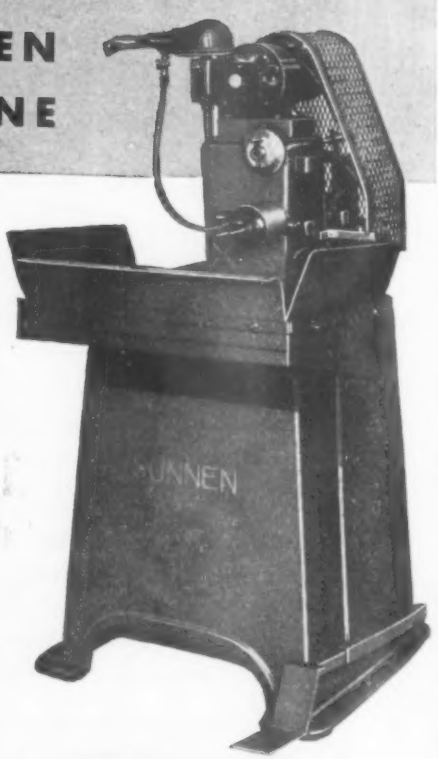
Cast Iron Valve Stem Guide. ½ to one thousandth removed—220 pieces per hour. Better finish and straighter hole.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish. is secured.

PARTS LAST LONGER

When Honed on the SUNNEN PRECISION HONING MACHINE



Time after time, users of the Sunnen Precision Honing Machine have shown that they get longer service and have fewer repairs than by any previous method of internal finishing.

There's a good reason for these results, too. This machine has an amazing record for accuracy. Straight, round holes are produced with a guaranteed accuracy of .0001". Accuracy has been held to .000025" on hardened steel jobs. A super-smooth finish of from 2 to 3 micro-inches provides a better working surface.

A new base and pump assembly, recently introduced, has improved results still further. The pumping unit provides a constant flow of honing fluid that acts as a coolant, carries away cuttings, and keeps the abrasive stone in sharp cutting condition.

There are many other reasons why the low-cost Sunnen Precision Honing Machine will give you a finish that makes parts last longer. Get complete information by calling a Sunnen engineer to your plant—or write for free bulletin.

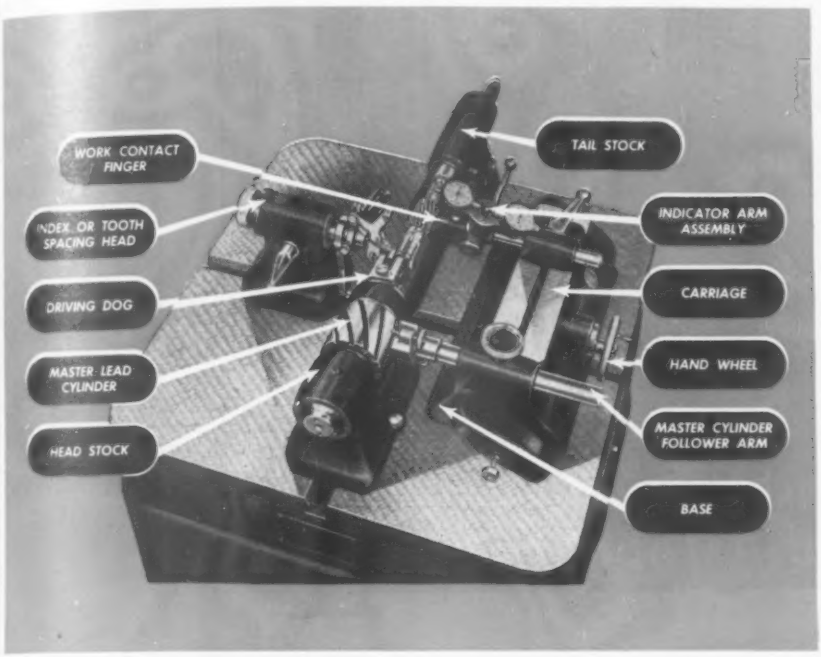
The coveted Army-Navy "E" waves over the Sunnen plant, evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

SUNNEN PRODUCTS COMPANY • 7932 Manchester Avenue • St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

CHECK GEAR ERRORS



INDEX
HELIX ANGLE
LEAD
TOOTH SIZE
ECCENTRICITY
INTERFERENCE
WOBBLE

The Red Ring Universal Gear Checker is a simple, compact instrument for accurately checking dimensional errors in either spur or helical gears. With the application of special equipment, this machine will check leads accurately against a master lead gage, errors being registered on a "tenth" indicator. Its simplicity makes it possible to check gears quickly without sacrificing accuracy. Its ingenious design practically eliminates the human equation and therefore the need for skilled operators.

The Red Ring Universal Gear Checker is built in three sizes, the 12" size for gears from 1/4" to 12-11/16" O.D., the 18" size for gears from 2" to 18 7/8" O.D., and the 24" size for gears from 3" to 24 7/8" O. D.

WRITE FOR DESCRIPTIVE BULLETIN

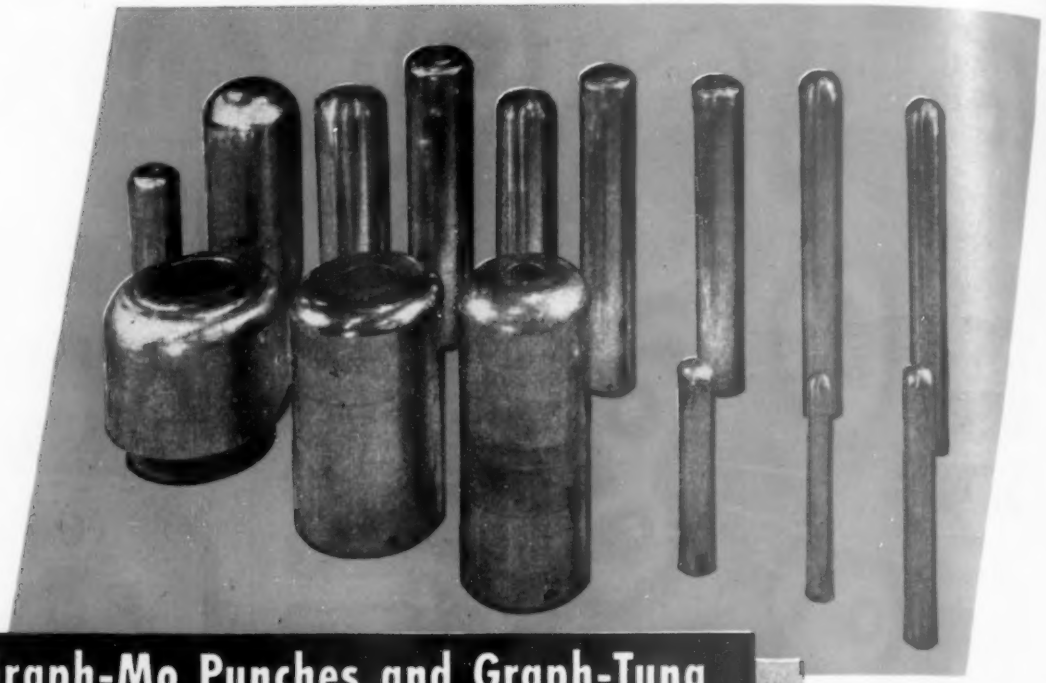
NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN • DETROIT 13, MICH.

Specialists on SPUR AND HELICAL INVOLUTE GEAR PRACTICE

Originators of ROTARY SHAVING AND ELLIPTOID TOOTH FORMS



These Graph-Mo Punches and Graph-Tung Dies . . . *Licked A Tough Job!*

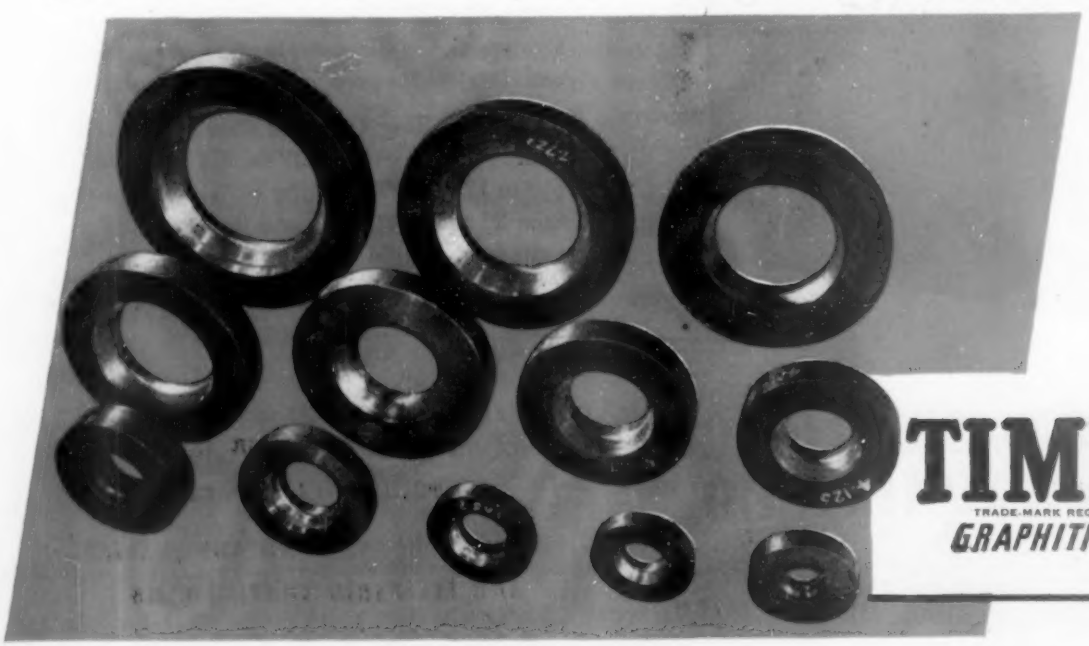
Forming gas cylinders used for oxygen containers for airplanes, carbon dioxide fire extinguishers, etc. presented a tough punch and die problem to a leading New Jersey manufacturer.

To meet rigid specifications for strength, weight and dimensional qualities the cylinders are made from tough drawing chromium-molybdenum steels. Punches and dies were a metallurgical problem and it was necessary to find a steel that had high wear resistance and a minimum of metal pickup.

Graph-Mo and Graph-Tung Steel, two of the five Graphitic Steels made by Timken, provided the solution to this difficult problem.

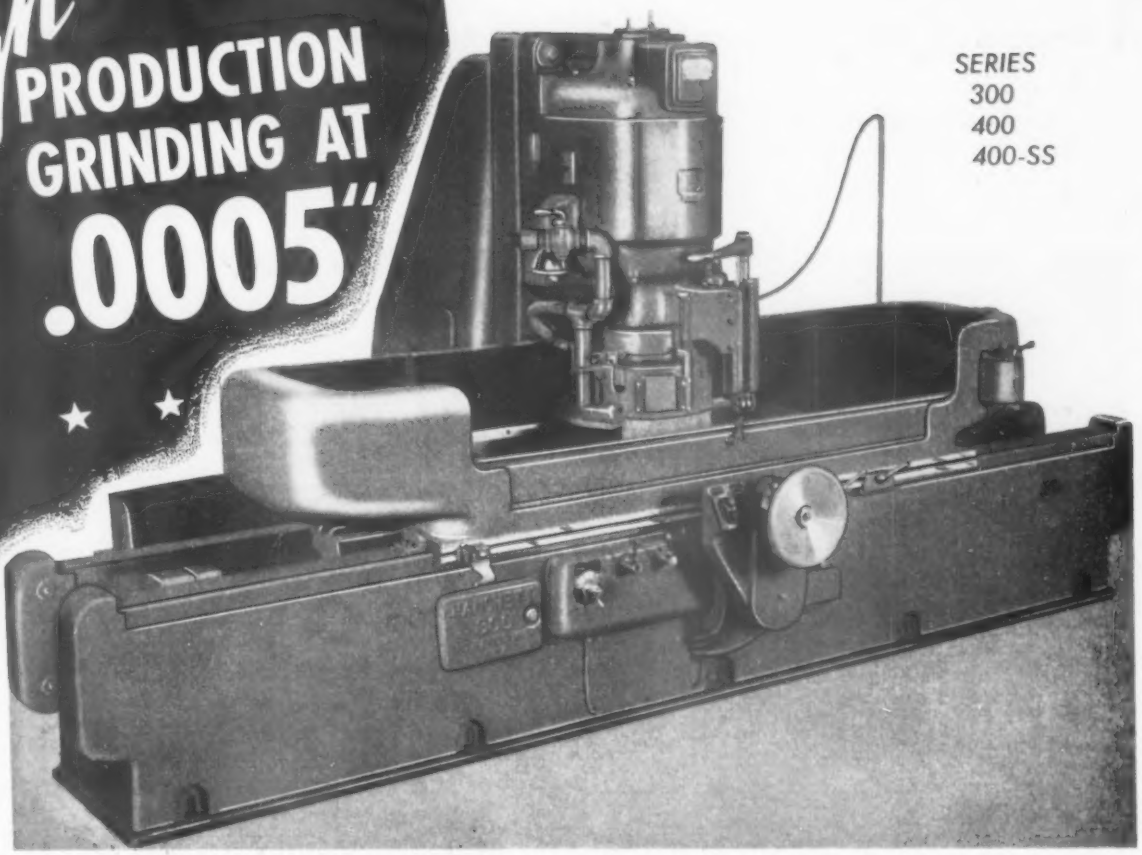
Trouble-free punches and dies made from these performance-proven steels produced accurate scratch-free cylinders that met the high standards this company set for their products.

Use Timken Graphitic Steels in your shop. Because they contain free graphite they provide good machinability, high resistance to wear, excellent response to heat treatment and have less tendency to scuff and score than ordinary tool steels. A combination of qualities that offers remarkable opportunities to meet the tough competition that lies ahead. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.



TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS

High PRODUCTION GRINDING AT .0005"



SERIES
300
400
400-SS

— That's regular performance on this Hanchett Surface Grinder. On special work, this vertical spindle, reciprocating table machine grinds to limits of .0002".

FLEXIBILITY for grinding a wide variety of work such as: Machine Parts — Wrenches — Shear Blades — Die Blanks — Gear Racks — Cutter Blanks — Small Tools — Long or Narrow Pieces.

IN 3 SIZES

Series	Wheel Motor	Grinding Wheel Diameter	Work Table Width	Work Table Length
300	25 hp.	14"	13"	36" to 72"
400	40 hp.	22"	18"	50" to 220"
400-SS	60 hp.	32"	28"	60" to 220"

FEATURES: Table speeds up to 90 f. p. m. Convenient controls. Universal adjustment for grinding Wheel Head. Forced feed lubrication. Efficient coolant system. Special switch to completely demagnetize chuck. Automatic sizing device to stop down-feed when work is to size. Visual ammeter on grinding wheel motor to check wheel performance.

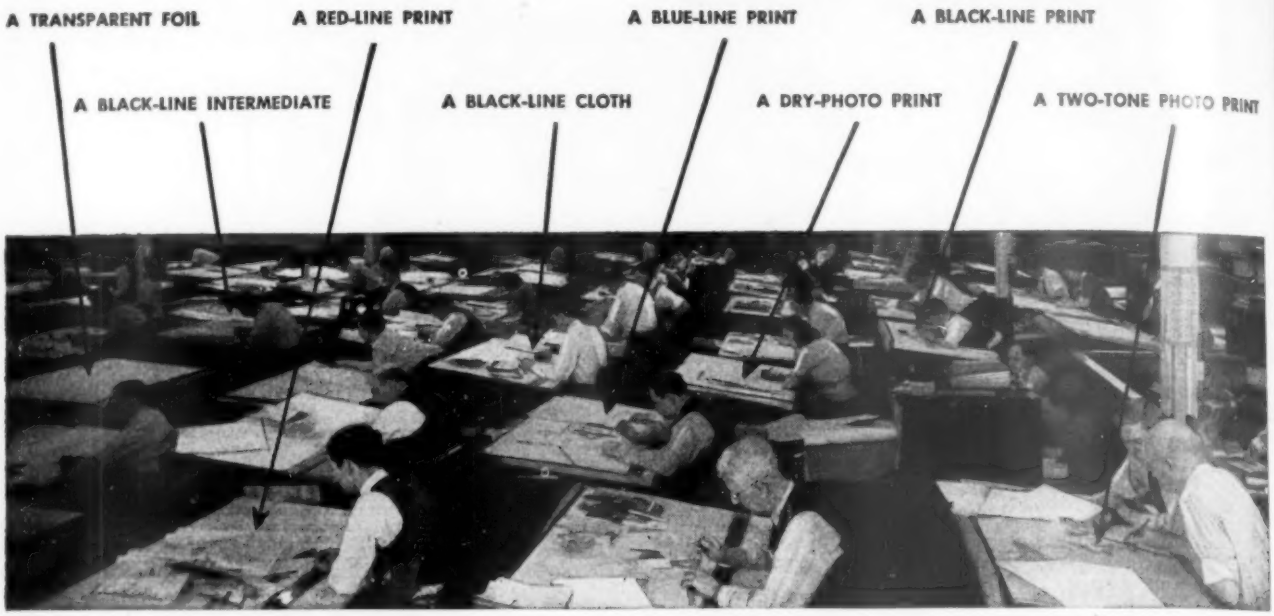
Get the full story of the Series 300, 400, 400-SS
Write for bulletin 170-T11

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

IMPOSSIBLE requests from the drafting room?



It depends on your printmaking equipment

IMPOSSIBLE when you rely entirely upon blueprint or semi-moist machines. Impossible because "wet" development gives you no choice.

POSSIBLE when you have an Ozalid Whiteprint machine (which prints and dry-develops) or an Ozalid Dry-developer which you can use with your present printer.

POSSIBLE because Ozalid eliminates chemical baths and driers . . . and allows the use of a really amazing variety of sensitized materials which react ONLY to the unique "dry" process.

SEE these prints yourself. Learn how quickly you can produce them, how you can save by using them in ALL departments.

OZALID PRODUCTS DIVISION

GENERAL ANILINE & FILM CORPORATION, JOHNSON CITY, NEW YORK

OZALID IN CANADA—HUGHES-OWENS CO., LTD., MONTREAL

WRITE for free booklet of Ozalid Whiteprints and catalog, TODAY.

3 JOBS WELL DONE *on the*

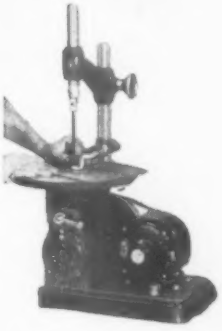
ILLINOIS DIE FILING MACHINE

1 - FILING

Designed for filing of intricate die shapes...table can be tilted to right or left up to 20° from horizontal. Hand files can be used.

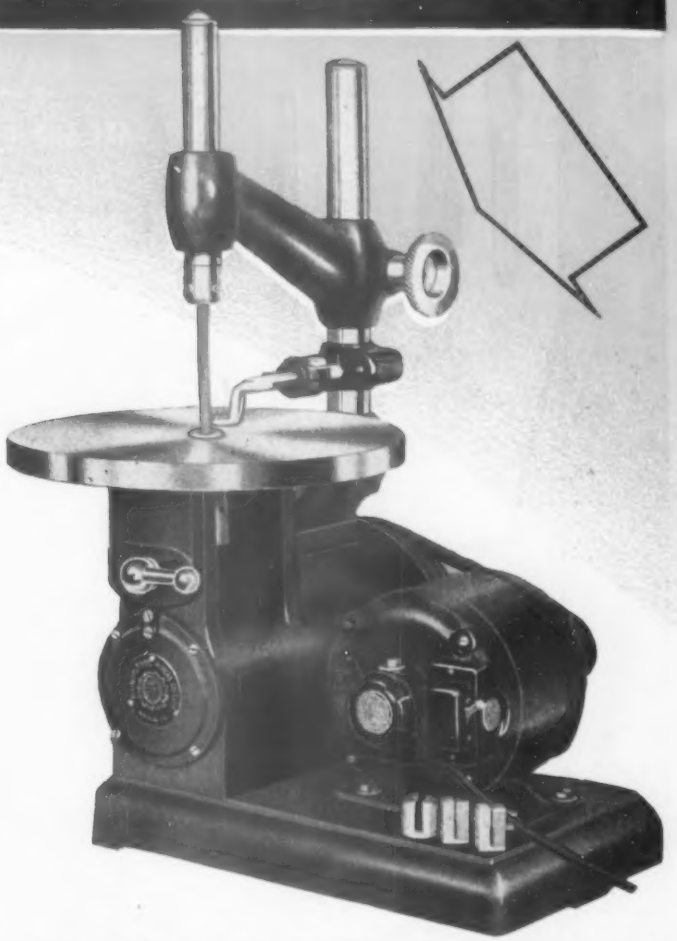
2 - SAWING

The table has a removable ring insert so that shank sizes of saws and files up to 6" length can be accommodated. Saw guide may be utilized as a hold-down finger.



3 - STONING

A finishing stone can be installed easily and quickly — which emphasizes the utility of this versatile machine that performs three major production steps: filing, sawing and stoning.



RAPID AND ACCURATE PERFORMANCE OF CRITICAL FINISHING OPERATIONS

PRECISION and BALANCE mark the Illinois Die Filing Machine which is designed to save time and do a superior job on finishing intricate die shapes. Convenient and adaptable, it is built with extreme precision and durability. Working parts are hardened and ground for accuracy and long life. Automatic forced feed lubrication reduces wear to a minimum. The Illinois Die Filing Machine relieves tedious hand filing of intricate shapes and assures greater accuracy at lower cost. Write for descriptive literature, today!

Overnight to All America . . . From the Hub of Air Transportation.

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In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCT

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Your request on your company letterhead will bring this new Lake Shore Tool Catalog to you.
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HOW ENGINEERED PRODUCTION WILL GIVE YOU

BETTER MILLING METHODS

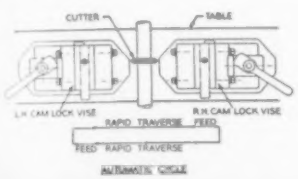
Whatever Your Milling Problem Is, It Can Be Solved Effectively with One of These Three Methods

Experienced and progressive process engineers always strive to solve their metal-working production problems with a minimum of equipment.

The following is a brief resume of the complete engineering and manufacturing service available from Sundstrand to meet all or any of your production milling requirements in small and medium size work.

1 Standard Rigidmils with Fixtures and Tooling to Suit Your Work

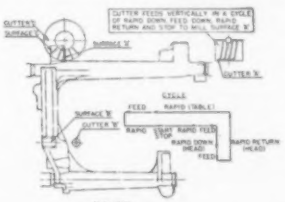
When possible, milling production problems are solved most economically by using standard Rigidmils supplied with standard attachments or simple fixtures and tools to suit the work. When such an arrangement cannot be employed profitably, the next most profitable solution is . . .

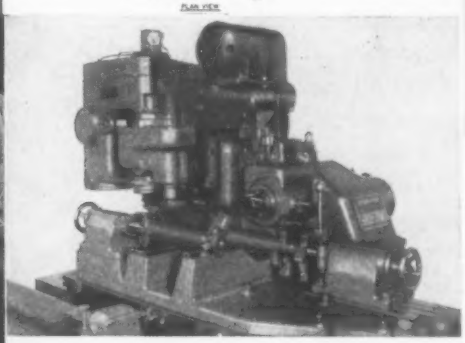


Standard Rigidmil provided with standard work holding vises. Machine is provided with a two-way table cycle, operator merely changes workpiece in vise at end of table opposite from milling, thereby enabling him to perform continuous milling. Production was increased to 175 more pieces per hour over the former hand milling method.

2 Standard Rigidmils with Special Heads and Tooling

All standard Sundstrand Rigidmils are designed to accommodate the application of a wide variety of special heads and tooling. When the requirements of the job at hand cannot be fulfilled with these specially tooled standard Rigidmils, Sundstrand Engineers recommend and design . . .

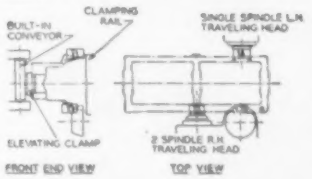


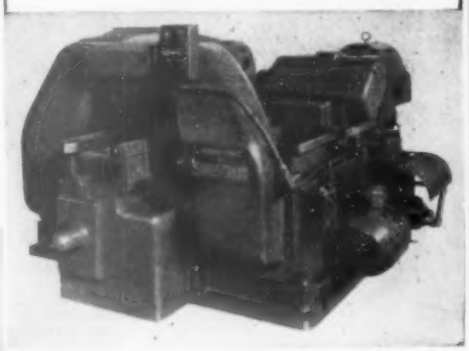


Sundstrand Rigidmil provided with special heads and tooling for milling three different surfaces—two horizontal, and one vertical, in one setting of the part. Adjustment is provided so that machine can handle several sizes of similar parts. Machine utilizes automatic cycle, making it necessary for the operator only to load and unload, and press the cycle start button.

3 Entirely Special Machines

Special machines are designed only when the required production cannot be obtained most economically with either of the foregoing methods. Sundstrand engineers have had wide special machine design experience for all types of metal-working plants . . . on diversified production milling problems in small and medium size work.





This special machine is designed to mill the generator pads, oil distributor pad, fuel pump and number pad of a cast iron cylinder block. Two opposed traveling heads mill the block simultaneously. The operator controls the entire automatic cycle and operation by merely pressing push buttons.

Get These Free Booklets or Call in a Sundstrand Production Engineer

These free booklets cover Sundstrand Standard Milling Machines. Write for them today. Ask for Bulletins 828. If your problem cannot be met with these standard millers, our engineers will be glad to assist in the designing of a special machine to do the job economically. Call on them without obligation.

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2532 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

DRILL WITH AIR

Easy as pointing your finger

Length—5-7/8"
Outside dia.—1-9/16"
Weight—1-15/16 lb.

It's natural to locate a spot by pointing. It is just as easy to drill with the air-powered Series 00A because it is built to fit the hand and weighs less than two pounds.

The small size of the "00A" is made possible by a compact "Multi-Vane" type air motor. All rotating parts are supported by high-grade ball bearings, which reduce friction losses. The handle contains a speed regulator for easy control of power and also a built-in lubricator. Reliable service and longer tool life are assured as the air motor does not heat up under any operating conditions and cannot be injured by overloading.

The extremely short over-all length (5 7/8") and small outside diameter (1 9/16") makes this tool particularly useful in very limited quarters where small, high power drills are essential.

The following gear ratios are available, each drill having the same dimensions as indicated above.

Size 00AH is suitable for extremely light high speed drilling in aluminum and other soft metals. Speed is 15,000 r.p.m.

Size 00AJ is suitable for drilling up to 1/8" in steel and for slightly heavier service in soft metals. Speed is 4500 r.p.m.

Size 00AK is suitable for drilling up to 3/16" in steel and slightly heavier service in soft metals. Average working speed is 2500 r.p.m.

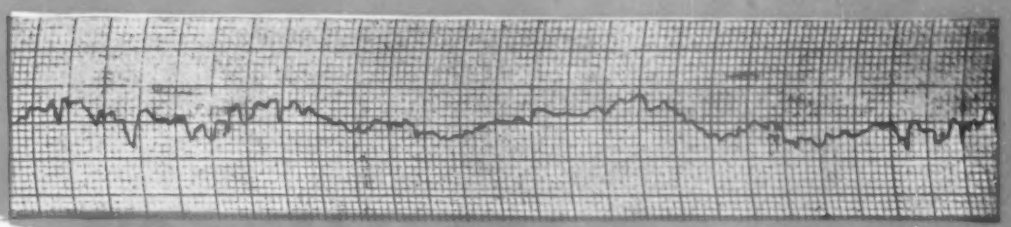
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

Size 00AK drilling 3/16 inch hole

8-491

Proof of a Better Finish



Each small square represents 1.0 micro inches. Micro inch r.m.s. = 0.9 — 1.6.

Surface Analyzer Tape Proves you Get a Better Finish with Chicago Wheels

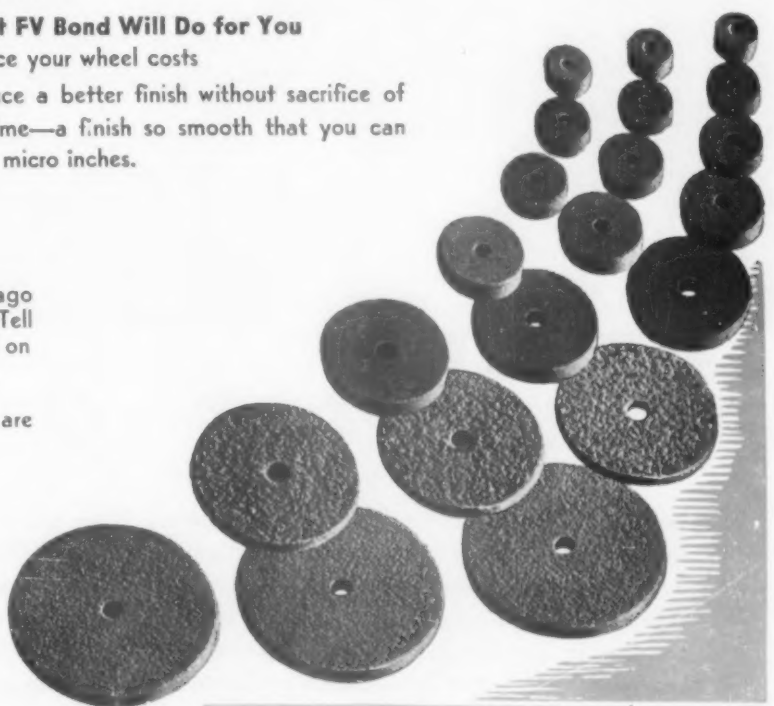
These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used, 1/2 x 1/2 x 1/8", Grain 180, Grade L Arcite FV Bond. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do it with Chicago Wheels. And, the secret of their superiority lies in the new FV Bond, developed exclusively for Chicago Wheels, after 50 years' experience making wheels for the most accurate and precise applications.

Here's What FV Bond Will Do for You

★ Reduce your wheel costs

★ Produce a better finish without sacrifice of production time—a finish so smooth that you can measure it in micro inches.



TRIAL WHEEL FREE

Write or send the coupon today for a Chicago Wheel, made with this remarkable new FV Bond. Tell us grinder you use, size wheel and kind of material on which you will make your test.

For the duration, with full WPB approval, we are specializing on small sizes—anything up to 3" in diameter.

Write for Catalog and one of the new Engineering Survey Forms, a step in the direction of better finishing.

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Industry.

CHICAGO WHEEL & MFG. CO.

America's Headquarters for Mounted Wheels and Small Grinding Wheels.

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TE-9

Send Catalog and Survey Form. Interested in
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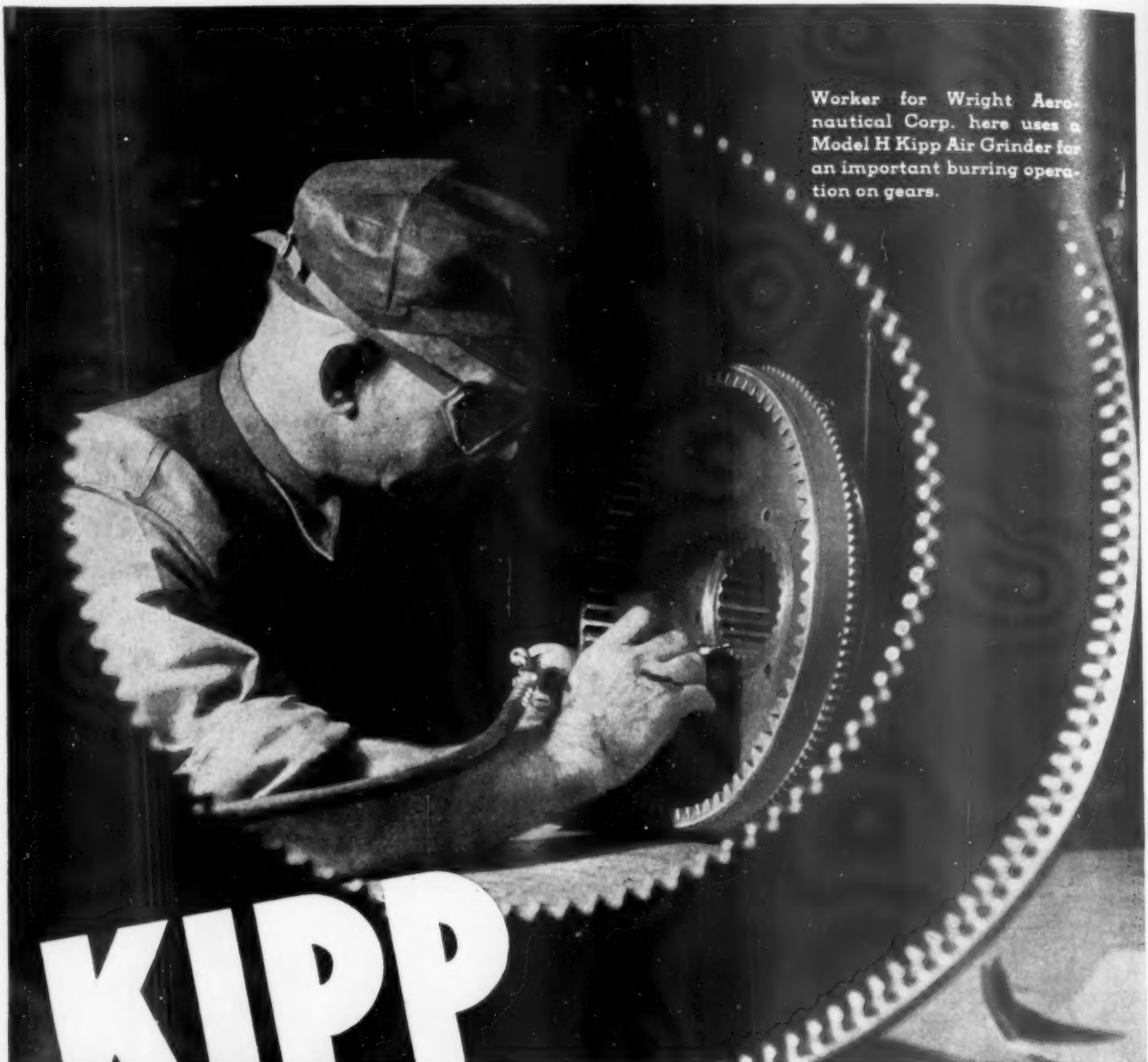
( ) Send Test Wheel. Size .....

Name .....

Address .....

HIGH SPEED GRINDING, HIGH SPEED PRODUCTION



Worker for Wright Aeronautical Corp. here uses a Model H Kipp Air Grinder for an important burring operation on gears.

KIPP *air grinders*

Every toolmaker, every tool crib, every machine shop and thousands of production jobs need a model H, K or VT Kipp Air Grinder or all three of them. Because of expanded facilities the delivery position on high ratings has been measurably improved. Accessories in reasonable quantities can usually be shipped out of stock. Madison-Kipp Air Grinders were developed by practicing tool makers so they are practical. They usually pay for themselves on a single job. Madison-Kipp Corporation, Madison 4, Wisconsin, U.S.A.

$29.75
Model H

MADISON-KIPP CORPORATION, 209 Waubesa St., Madison 4, Wis., U. S. A.

Sole Agent in England: Wm. Coulthard & Co., Ltd., Carlisle

HOW ONE MAN Using Remote Control DOES BETTER WORK THAN TWO . . .

(Above) Operator boring and facing main bearing bore in marine turbine gear case. Machine is operated by remote control through the portable control panel shown.

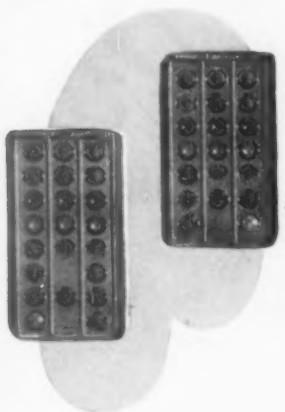
A SINGLE OPERATOR with a Portable Push-Button Station CONTROLS ALL OPERATIONS

Machining this large weldment would ordinarily require two men—one to control the machine—the other to direct machining operations. But with a remote control station close to the cutting point, the operator can leave his normal position on the operating platform, maintain complete control over all operations, and do it better than by relaying instructions to a second man.

The portable push-button station is equipped with a flexible cable long enough to reach any point within the working range of the machine. This station is a duplicate of the control panel mounted on the headstock, and operations can be controlled from either position. Large work requiring internal machining that cannot be readily performed from the outside is no problem. The operator simply removes the control panel from its pedestal and takes it along inside, maintaining full control over all operations.

Most large G. & L. machines are regularly equipped with remote control. Similar machining problems in your own plant may be easily overcome. Experienced G. & L. engineers will be glad to recommend equipment best suited to your needs. There is no obligation for this service.

(Above) Appearance of portable control station when hung on a pedestal, handy to the work.



(Above) Various types of control stations used for mounting on the headstocks.

Additional Data

available—Complete information on G. & L. machines and attachments is given in Bulletin No. TE94—write for your copy today. Kindly indicate business connections.

GIDDINGS & LEWIS MACHINE TOOL CO.

132 DOTY STREET, FOND DU LAC, WISCONSIN

Precision —

THE DISTINGUISHING QUALITY OF SOUTH BEND LATHES

It is for their high precision that South Bend Lathes are best known. Their dependable accuracy has made them first choice for the most exacting work in hundreds of essential war production plants. Finish turning and boring operations are often performed with such exactness that subsequent grinding, honing, or lapping is unnecessary.

In war production, there is no place for equipment that can not hold required tolerances or deliver maximum output. Investigate the possibilities of South Bend Lathes for handling your exacting jobs with greater efficiency. With them, you will find it easier to maintain precision tolerances on toolroom and production operations.

POST-WAR PRIORITY PLAN

To those who cannot qualify for a war-time priority, South Bend Lathe Works offers a practical Post-War Priority Plan. You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that the order be placed in good faith. When civilian production is resumed, orders will be filled in the sequence established by the numbers of the Post-War Priority Certificates. Should conditions necessitate, the order may be cancelled at any time.

BUY WAR BONDS NOW...SAVE FOR LATHES

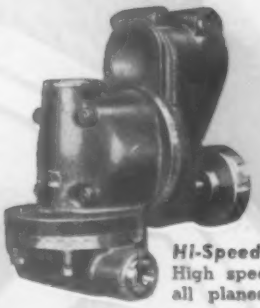
SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA

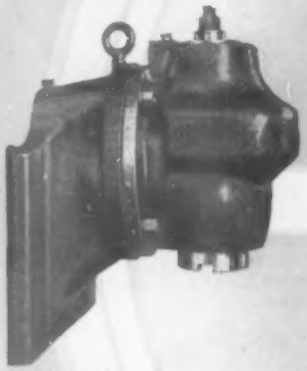
Keep Wheels of Industry Rolling with KEMPSMITH *Standard* ATTACHMENTS

Heavy Duty Universal
Heavy duty angular milling in all planes. (Bulletin No. 104)

Circular Table
Milling circles or cams, gear cutting, high-speed continuous milling, etc. (Bulletin No. 106)

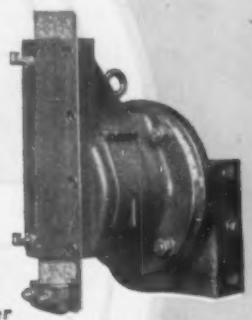


Hi-Speed Universal
High speed angular milling in all planes. (Bulletin No. 113)



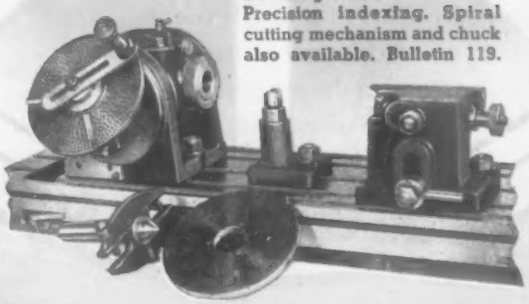
Vertical Head
Converts horizontal to vertical machine, retaining identical spindle characteristics. (Bulletin No. 105)

BROADEN THE SCOPE OF YOUR MILLING MACHINES

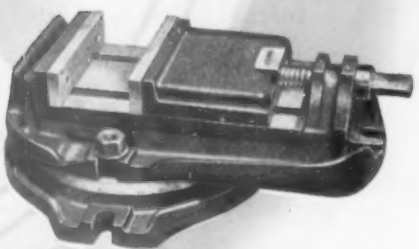


Slotter
Keyseating, broaching, general slotting, tool and die making, etc. (Bulletin No. 107)

Arbors and Accessories
A full range for standardized spindles carried in stock. (Bulletin 116)



Dividing Head
Precision indexing. Spiral cutting mechanism and chuck also available. Bulletin 119.



Vises
Standard and Heavy-Duty, plain and swivel types. Adaptable to special jaws to save fixtures. (Bulletin 117)

Convert your general duty milling machine to a special purpose miller by utilizing Kempsmith Standard Attachments.

It's really surprising, the great variety of milling operations that can be handled by Kempsmith *Standard* Attachments mounted on a standard milling machine. The same high degree of rigidity and precision characteristic of Kempsmith Milling Machines for more than 56 years is embodied in these sturdy standard attachments. Thousands are serving industry, every day, performing the most delicate and accurate operations, or handling difficult production milling jobs.

So plan now on broadening the scope of YOUR milling machines by applying Kempsmith Standard Attachments. Write for bulletins designated above.

THE KEMPSMITH MACHINE CO. • Milwaukee 14, Wis., U. S. A.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

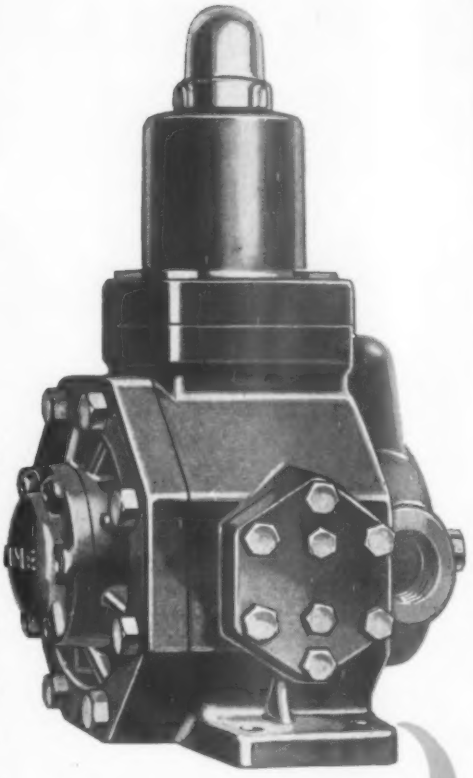
RACINE
Oil Hydraulic
PUMPS and PRESSURE BOOSTERS

The Variable Volume principle incorporated in the design of Racine Pumps reduces horsepower requirements and provides a great flexibility of operation. These pumping units are of the multiple radial vane type, producing a smooth, quiet delivery at all operating pressures.

Volume ranges from zero to the full capacity of the pump. Changes are accomplished by regulating the relative position of the pressure chamber ring to the rotor. These changes are available under automatic, manual or hydraulic control. High efficiency is inherent in the simple design of Racine Pumps and is safeguarded by skilled workmanship and the maintenance of exacting tolerances on all parts.

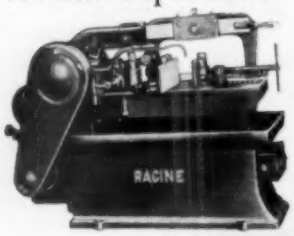
Racine Hydraulic Pumps, Valves, Controls and Pressure Boosters have been used for many years in a wide variety of applications. Manufacturers of machine tools, presses, molding machines, lifts, stokers and a large group of other products, have standardized on Racine equipment.

Consult our Engineering Department. Out of their long and varied experience valuable information is available to you without cost or obligation. Write today for a copy of Catalog P-10-C which illustrates the full Racine Line. Address Dept. TE-P.



Racine Variable Volume Pumps — Capacities 12-20-30 G.P.M. Operating Pressures 50 to 1000 lbs. P.S.I. Furnished for either clockwise or counter-clock rotation.

Racine Pressure Booster — Compact, self-contained, requires no special foundation. Available in several ratios. Converts low pressure oil to high pressure in ratios as high as 7 to 1. A simple, hydraulically actuated pumping device adaptable to any circuit. Equally effective with constant and variable volume pumps. 10⅛" high, 8⅛" wide, 18" long.



RACINE HYDRAULIC METAL CUTTING MACHINES

For almost 40 years Racine has built constantly improved high speed Metal Cutting Machines. All capacities from 6" x 6" to 20" x 20" are available. See these machines as illustrated in catalog No. 12. Select the model best adapted to your production, maintenance or tool room job.

STANDARD FOR QUALITY AND PRECISION
RACINE
RACINE TOOL and MACHINE CO.

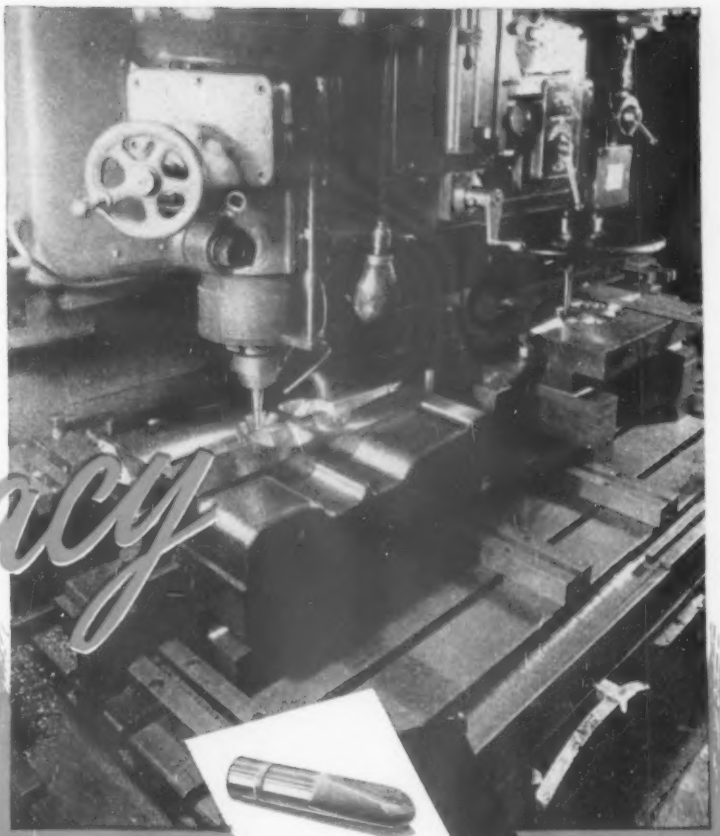
RACINE TOOL and MACHINE COMPANY
Standard for Quality and Precision
RACINE, WISCONSIN, U. S. A.

GEAR YOUR CUTTING

TO T-J

Accuracy

WITH MORE WORK BETWEEN GRINDS!



Give your cutting operations the extra measure of *speed, accuracy* and *efficiency*... assured with T-J DIE SINKING MILLING CUTTERS!

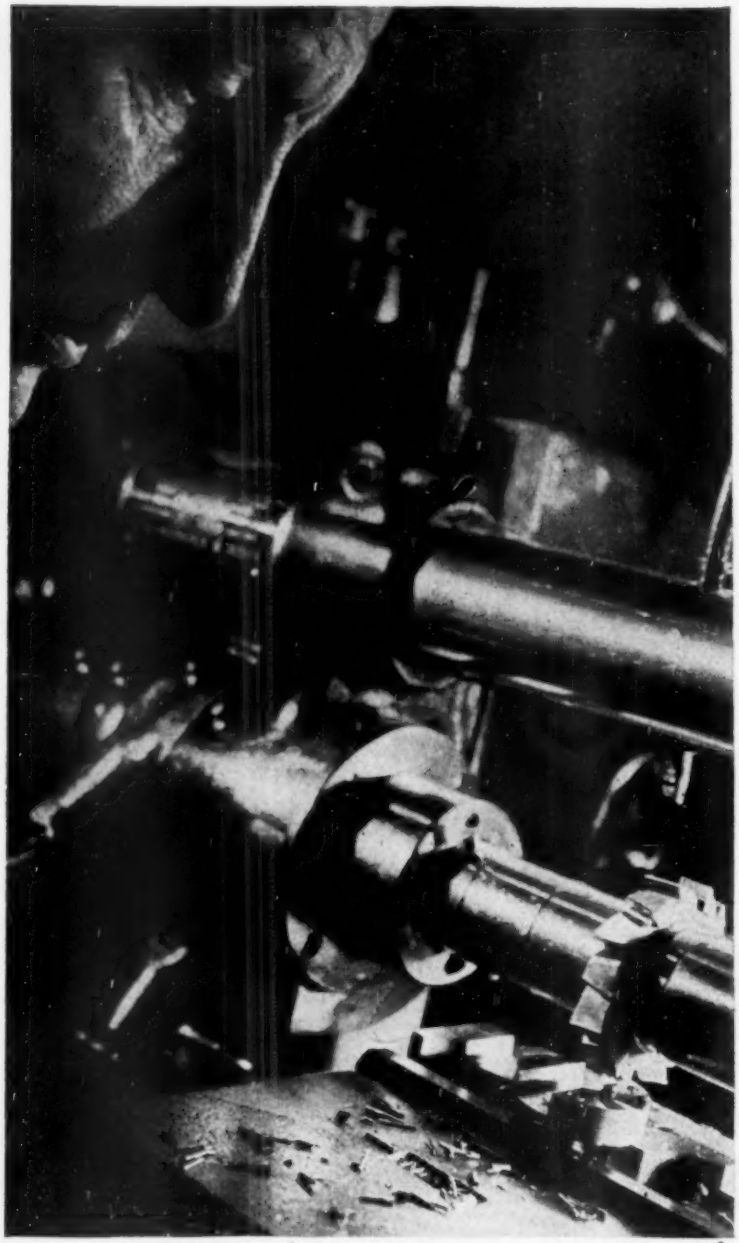
Shop men find they get more work between grinds with T-J Cutters. Designed and built *right* for sturdiness...ability to hold a sharp edge longer...and carry less breakage percentage. Made from a standard, extremely high grade steel...assuring extra strength, wear resistance and uniformity. Backed by long years of T-J Leadership in building better cutters! Write for catalog.

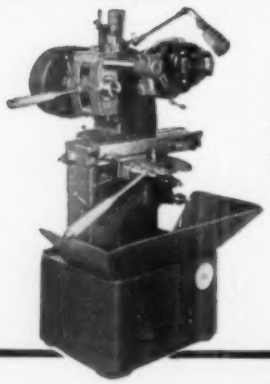
The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

DIE SINKING MILLING CUTTERS





WORKING SURFACE: 6¾" x 21", or 6¾" x 30". RANGE: Longitudinal, 10" or 19"; Transverse, 7"; Vertical-Knee, 13"; Spindle Rise and Fall, 4½". STANDARD SPEEDS: to 2400 RPM. SPECIAL SPEEDS: to 5000 RPM.

LOWER COST
per piece milled

WHETHER YOURS is a large plant or a small shop you will be interested in the low-cost-per-unit-of-production features of the Nichols Miller.

Take these performance records:

A broaching machine was originally used to cut a wrench slot in a bearing. Output, 3,000 pieces every twenty-four hours. The job was placed on the Nichols Miller with a specially designed fixture and production immediately increased to 9,000.

Where a turret lathe produced 100 units per day of a part requiring a hole-diameter tolerance of ±.0005", the Nichols Miller turned out 300!

That's why, on production lines everywhere, you can see this versatile machine performing dozens of different high-speed machining operations under the same roof—often doing the work of precision boring machines, lathes and grinders more economically to tolerances in "tenths."

For the Nichols Miller is not an ordinary hand miller. Starting with the fundamental principle of bringing the cutter on a sliding head down to the work, W. H. Nichols & Sons has engineered around it a machine tool that permits countless precision operations heretofore considered only within the scope of heavier, costlier millers.

How industry puts the Nichols Miller through its paces is illustrated in an 86-page handbook of unusual applications. Write for it today.

MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

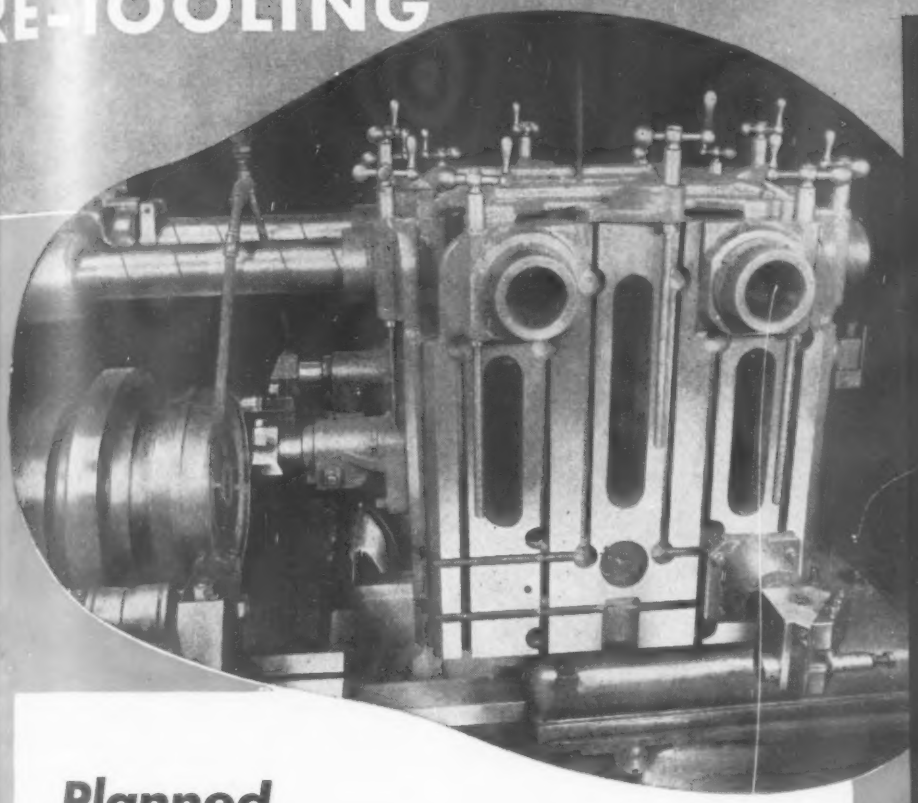
THE NICHOLS MILLER

"The Miller That Uses Its Head"

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 46 CHURCH ST., NEW YORK 7, N. Y.

Dealers in all principal cities

THE VALUE OF P & J VERSATILITY becomes even more apparent...through RE-TOOLING



Planned Production of Bearing Cones

Here is shown a P&J 7-D Automatic tooled for turning out double cones of forged steel for large Timken Bearings for use on locomotive axles. Production was unusually high with operating costs an absolute minimum. Complete details of this job were told in these pages *six years* ago.

Planned Production Will Still Pay Dividends

Pre-war production figures can be met and bettered on the same P&J machines re-tooled for post-war jobs. The outstanding versatility of P&J equipment makes this possible. It means that your present machines tooled for a specific job are still capable of paying big dividends on other jobs. It further means that with the help of P&J engineers, you have an opportunity today to plan for tomorrow's production and be assured of achieving that low cost which will be the objective of the future.

We suggest that you start your planning now by having P&J engineers show you the practicability and economy of RE-TOOLING your present P&J equipment to meet your specific requirements.

P&J REBUILDING SERVICE

In many shops P&J machines have been subjected to long, hard service. These machines offer possibilities for rebuilding to their original accuracy and performance. All work is handled in the P&J plant by P&J experts. Re-tooling can also be handled at the same time. Investigate now.

BUY BONDS *and* SHORTEN THE WAR

POTTER & JOHNSTON MACHINE CO.,

Pawtucket, R. I.

PRECISION HAS FAILED!

(A DISCUSSION OF TODAY'S ASSEMBLY PROBLEMS)

When there is a rejection of a precision-part assembly in any plant, Precision has failed.

When there is varying performance of two or more mechanisms assembled from interchangeable, identical precision parts, Precision has failed.

Take issue if you will, but why will your precision products vary?

Why will two identical pumps, generators or other mechanisms have varying performance characteristics? Why will one automobile operating under the same conditions as its twin achieve superior mileage or performance?

Although through science and craftsmanship interchangeable parts are being produced to extreme tolerances, the application of this precision—Precision of Assembly—depends on the man or woman with the wrench. And what does he or she know about ten-thousandths of an inch? Or half an inch-pound torque? Some understand. Most do not.

Case histories in our files offer illustrative proof that the man or woman with the wrench is the decisive factor in final precision.

Douglas Aircraft Company, in one instance, reduced inspection complaints on an assembly from 100 to 6 per day by giving the man with the wrench the proper tool for Precision Assembly.

In our work with many leading manufacturers, we have been able to help them reduce rejects, cut costs, achieve identical peak performance operation of precision mechanisms, produce faster.

One of the requisites to Precision Assembly is precision torque. Let our engineers discuss this particular phase of manufacturing with you. Write to Department TE-9.

RICHMONT, INC.

Originators of Precision Assembly Methods • Manufacturers of the Livermont Torq-Stop Wrench, the precision production-line torque wrench
215 West 7th Street, Los Angeles 14, California • Eastern Representative, 428 New Center Building, Detroit 2, Michigan

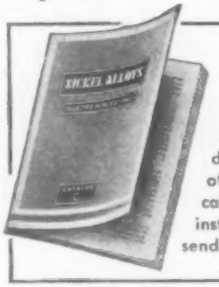
NICKEL AIDS IN THE AUTOMOTIVE INDUSTRY

to SPEED 'EM UP!

The ingenuity and experience of automotive engineers made possible the design of military vehicles, engineered for quality and quantity production in numbers that amazed the world. This kind of engineering-thinking pioneered the application of Nickel alloyed materials and foreshadows new achievements in the realm of peacetime automotive transportation.

In steering knuckles or differentials, in forged gears or cast blocks, a little Nickel goes a long way to provide essential dependability. It improves strength/weight ratios, increases wear and corrosion resistance, imparts toughness, and assures uniform properties of the metals with which it is combined.

For years the technical staffs of International Nickel have been privileged to cooperate with automotive engineers and production men. Counsel, and printed data about the selection, fabrication and heat treatment of ferrous and non-ferrous metals is available upon request.



Catalog "C" **makes it easy for you to get booklets and bulletins on industrial applications of Nickel, metallurgical data and working instructions. Why not send for your copy today?**

★ *Nickel* ★

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

ANOTHER EXAMPLE OF

BARBER-COLMAN

HOBBING PERFORMANCE

BLANK

HOBBING

CLOSE-UP

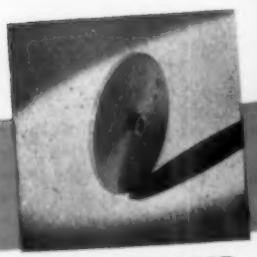
CHECKING

EXTREMELY ACCURATE GEARS HOBBED IN ONE CUT ON B-C No. 3 HOBBING MACHINE

This is an outstanding example of how highly accurate modern hobbing practice can be. These 17ST duraluminum gears are particularly precise parts of an extremely sensitive fire-control director. The pictures show steps employed in cutting these gears, which range from .281″ to 4.730″ diameter, including 32, 48 and 64 D. P. The blanks are highly finished and held to .0005″ face runout from the hole, the hole itself being held to +.0006″/−.0000″. The work arbor held in a floating type chuck, is trued up within .0001″, and parallelism to the hob slide is held within .00025″. Extremely accurate ground hobs with taper bore are used, and run true within .0002″. The machine is a Barber-Colman No. 3 Precision Hobbing Machine set up for .012″ feed per rev. of work and hob speed of 230 r.p.m. The result is that the finished gears roll within .0004″ kickout and .0003″ P. D. eccentricity. On a production run of 4500 pieces per month, rejects were only 3.3%. *When the job calls for production with extreme accuracy, use Barber-Colman Hobbing Machines and Hobs.*

BURRING

CLEANING TEETH



FINISHED GEAR

FINAL INSPECTION

PACKAGING

Buy War Bonds

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 105 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

HAYNES STELLITE 98M2 ALLOY ROUNDS

These Cobalt-Chromium-Tungsten Rounds are used for . . . .

- Turning, Boring, or Facing Tools.
- Machinery Parts Where a High Resistance to Abrasion, Heat, and Corrosion is Required.

• These cobalt-chromium-tungsten alloy rounds are finished on centerless grinders to standard limits of plus 0.000 in., minus 0.002 in. on diameter; plus or minus 1/16 in. on length, unless otherwise specified. The twelve standard sizes listed below are available for prompt shipment. Special sizes to users' specifications can be furnished on request.

For information on how HAYNES STELLITE tools can be used to increase production at lower cost per piece machined, send for the booklet, "Operating Information on Haynes Stellite 98M2 Tools." Ask for Form 5350.

Haynes Stellite Alloy Standard Rounds are Available in These Sizes

Diameter, in.	*Maximum Length, in.*	*Diameter, in.*	*Maximum Length, in.*
1/8	2	9/16	6
1/4	4	5/8	6
5/16	4	11/16	6
3/8	5	3/4	6
7/16	6	7/8	6
1/2	6	1	6

HAYNES STELLITE TRADE-MARK

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York 17, N. Y. UCC Kokomo, Ind.

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company.

HARDINGE

Style "S" SURE-GRIP MASTER COLLETS and PADS

Available for Cleveland, Cone, Greenlee, Gridley and Acme-Gridley, National Acme and New Britain Automatics taking draw-in style collets with a capacity of 1" or more. Pads interchange between machines of similar capacity

Give solid collet performance

Solid collet performance with Hardinge Style "S" exists simply because the head angle of the master collet and the gripping surfaces of the pads are the same as solid collets. There are no holes in the head angle nor tapped holes in the collet pads. There is an independent lock to anchor each pad section in place.

FEATURES

1. Permits size change without removing collets from the machine spindle.
2. Final tightening possible for pads when closed on bar stock.
3. Greater accuracy. This feature is due to the fact that pads can be ground accurately on an arbor. The greater accuracy with hexagon or square pads will particularly help you in production.
4. Master Collet design affords maximum strength.
5. Lower cost – make comparisons in price and performance and you will soon standardize on Hardinge Style "S".
6. Lower inventory possible. Pads are interchangeable between different makes of automatics employing draw-in style collets with similar capacity.

Write for this latest bulletin.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR **HARDINGE** ELMIRA, N.Y.

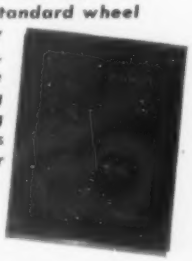
Here's the kind of edge produced with a

DI-MET DIAMOND WHEEL

THIS unretouched photo shows a carbide insert ground with a DI-MET resinoid bonded diamond abrasive wheel. The edge produced is smooth, and exceptionally keen —greatly lengthens tool life—produces more work, better finishes, saves power and strain on the tool and the machine.

DI-MET diamond wheels are economical to use because they're so long-lived . . . produce exceptional finish . . . have ability to hold size which makes accurate grinding of multiple tipped cutters easy . . . save many man hours of grinding time besides increasing cutter life.

DI-MET diamond wheels for all carbide grinding and cutting-off operations are made in diameters through 6" in all standard wheel types. Where exceptionally high polishes are required, DI-MET diamond hones are available. Our free catalog furnishes general grinding tips, DI-MET wheel sizes, types and prices. Write for your copy today!



ARMY E NAVY

FELKER
DI-MET

FELKER MANUFACTURING CO.

1121 BORDER AVE., TORRANCE, CALIF.

MANUFACTURERS OF DIAMOND ABRASIVE WHEELS

TO MANUFACTURERS NOT YET USING *Cold Treating*

1 HARDENING OF TOOL STEEL

A few tools and machine parts cold treated in one plant are shown on the table of the Deepfreeze Cascade —120° F. Industrial Sub-Zero Chilling Machine.

2 SHRINKING OF METALS

Shrinking an airplane landing strut in Deepfreeze —120° F. Industrial Sub-Zero Chilling Machine for shrink-fit assembly. Time reduced 50% — production doubled.

3 STABILIZING OF METALS

Stabilizing gauges and gauge blocks within .000002" in a Deepfreeze —120° F. Industrial Sub-Zero Chilling Machine.

4 TESTING OF INSTRUMENTS

Testing aviation instruments, metal and plastic parts in a Deepfreeze Model D-70 Industrial Chilling Machine to insure perfect operation under stratosphere flying conditions.

Here's How Others Are Getting the Advantages of Deepfreeze Sub-Zero Temperatures

● Deepfreeze Industrial Sub-Zero Chilling Machines are being used daily to harden cutting tools, stabilize gauges, shrink many steel parts for assemblies of various types, and to cold test aviation instruments and parts. For instance, tool life of high-speed drills, used to drill 4 holes in a yoke lever part, was increased over 500% by cold treating in the shop of one large machine tool manufacturer.

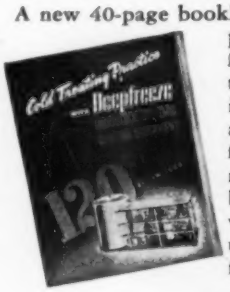
Equally remarkable results were obtained by using Deepfreeze sub-zero temperatures to stabilize gauge blocks and lapping flats, with the result of increasing their life 2000%. Another manufacturer uses a Deepfreeze Industrial Chilling Machine with automatic feed to shrink valve insert seats for engine blocks with a saving of $3,675 per year over the cost of dry ice. These are but a few of the many applications manufacturers are finding for Deepfreeze Sub-Zero Temperatures.

How to Determine What Benefits You Can Get From Cold Treating

To determine the exact benefits that your company can derive from applying cold treating to your production, consult the Deepfreeze Engineering Service, which is conducted expressly for this purpose. Your inquiry will not obligate you in any way.

Free . . . New Cold Treating Textbook

A new 40-page booklet containing complete up-to-date information on cold treating and including new procedures, applications, performance data stories, etc., has just been published and will be sent to you upon request. Write for Bulletin No. 1-4.



Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

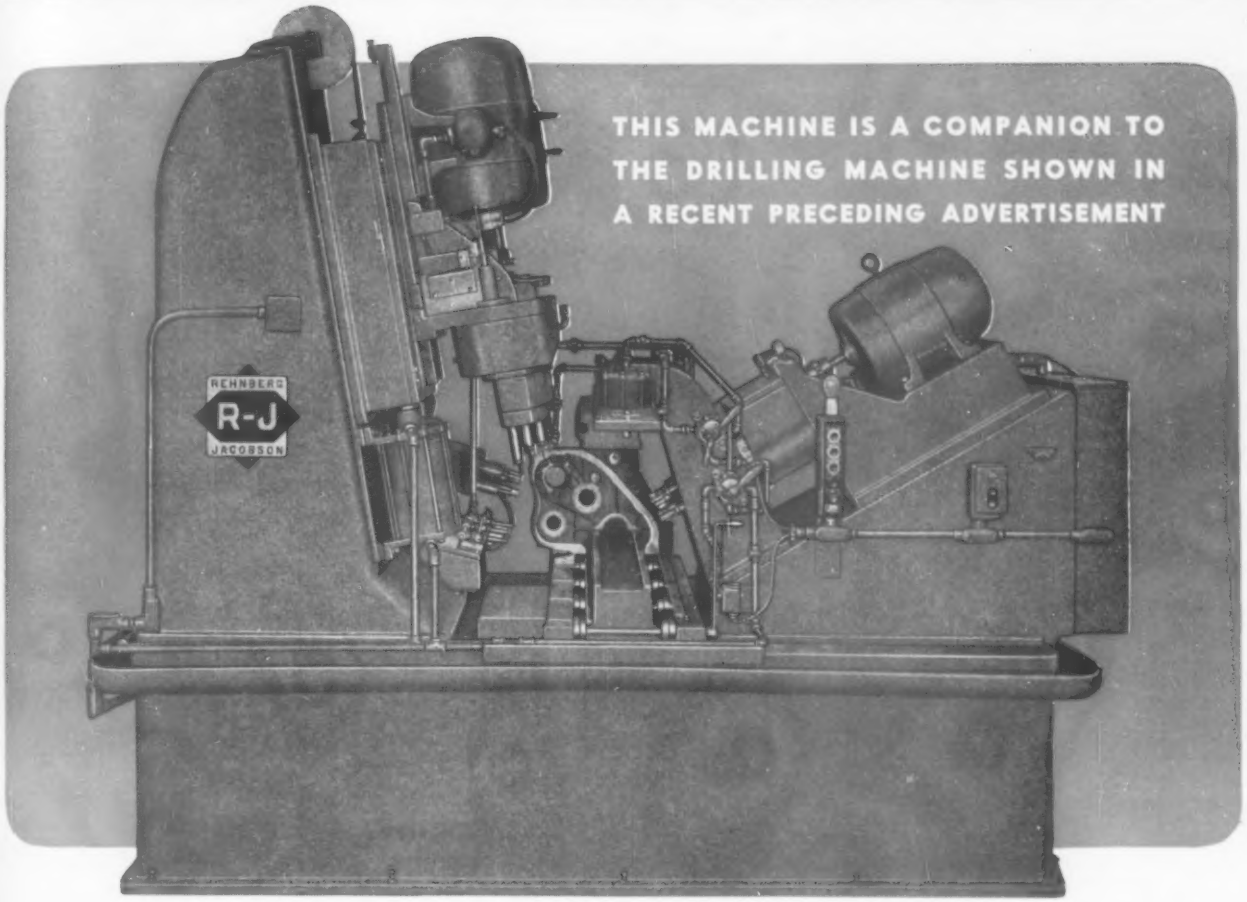
2311 DAVIS STREET
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Michigan

Rehnberg-Jacobson



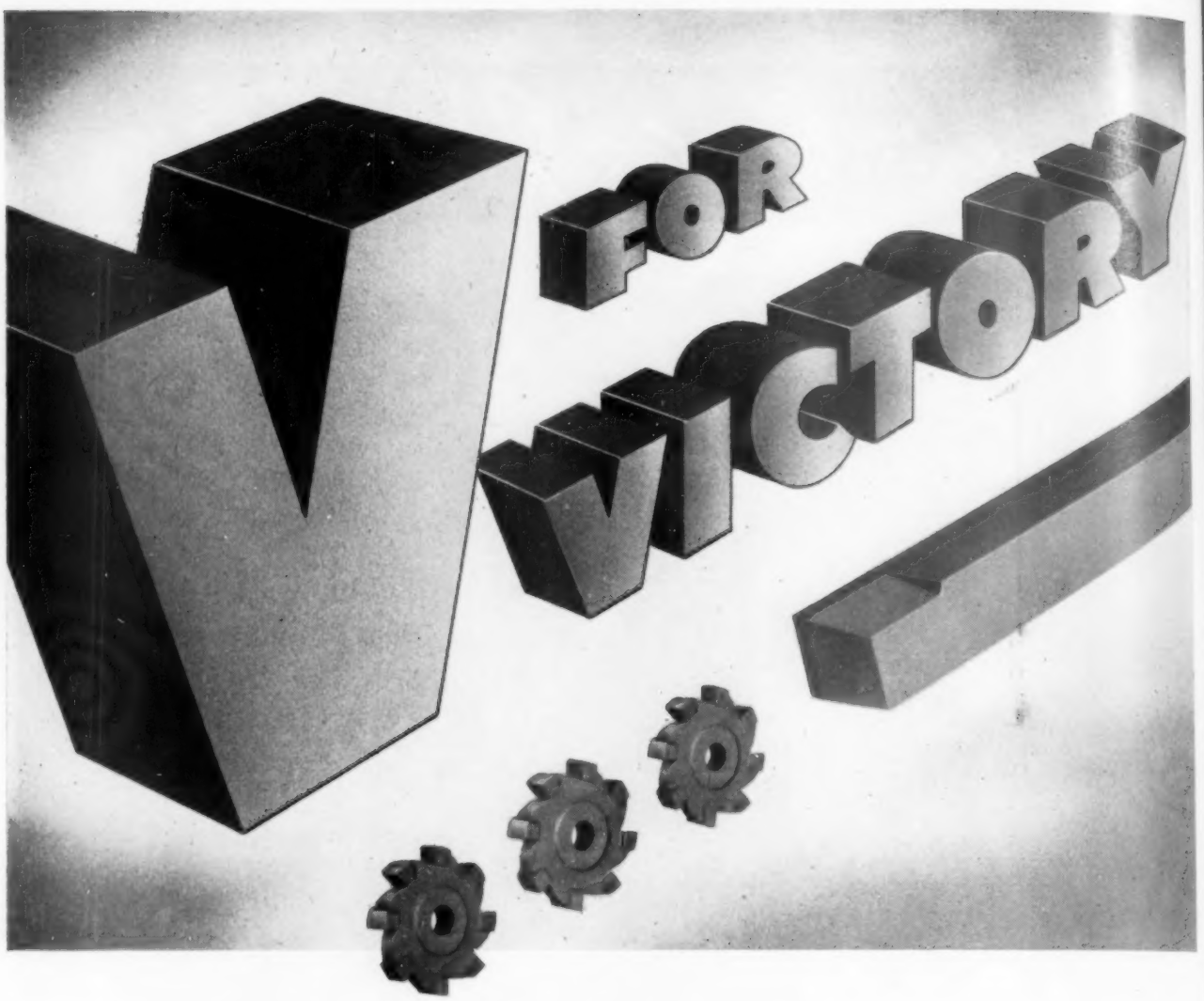
SPECIAL TAPPING MACHINE AUTOMATICALLY FINISHES ALL ANGULAR HOLES IN NEW TRUCK ENGINE BLOCK

The block comes to this machine with all holes drilled and countersunk ready for tapping. The operator pushes it into place, and clamps it quickly and accurately with two air cylinders. He then opens another air cylinder valve to start the cycle. The heads are rapid traversed by air to a positive stop and thereupon they trip switches which start the tapping cycle. Each of the 25 tap spindles has its own individual lead screw. Taps are of various sizes ranging from 1/4-20 up to pipe threads. Motors are automatically reversed to withdraw the taps and the last set out trips the air cylinders to return the heads to clearance position.

This machine is a good example of Rehnberg-Jacobson simplicity and ingenuity of design, and makes an extremely economical production unit. Let us apply R-J principles to YOUR production problems.

REHNBERG
R-J
JACOBSON

REHNBERG-JACOBSON MANUFACTURING CO.
Special Machinery
2137 KISHWAUKEE ST. ROCKFORD, ILLINOIS



TOUGH Cooper-Bessemer Meehanite tools are spelling out Victory over tough cutting problems in hundreds of American machine shops, where they are speeding production of war equipment.

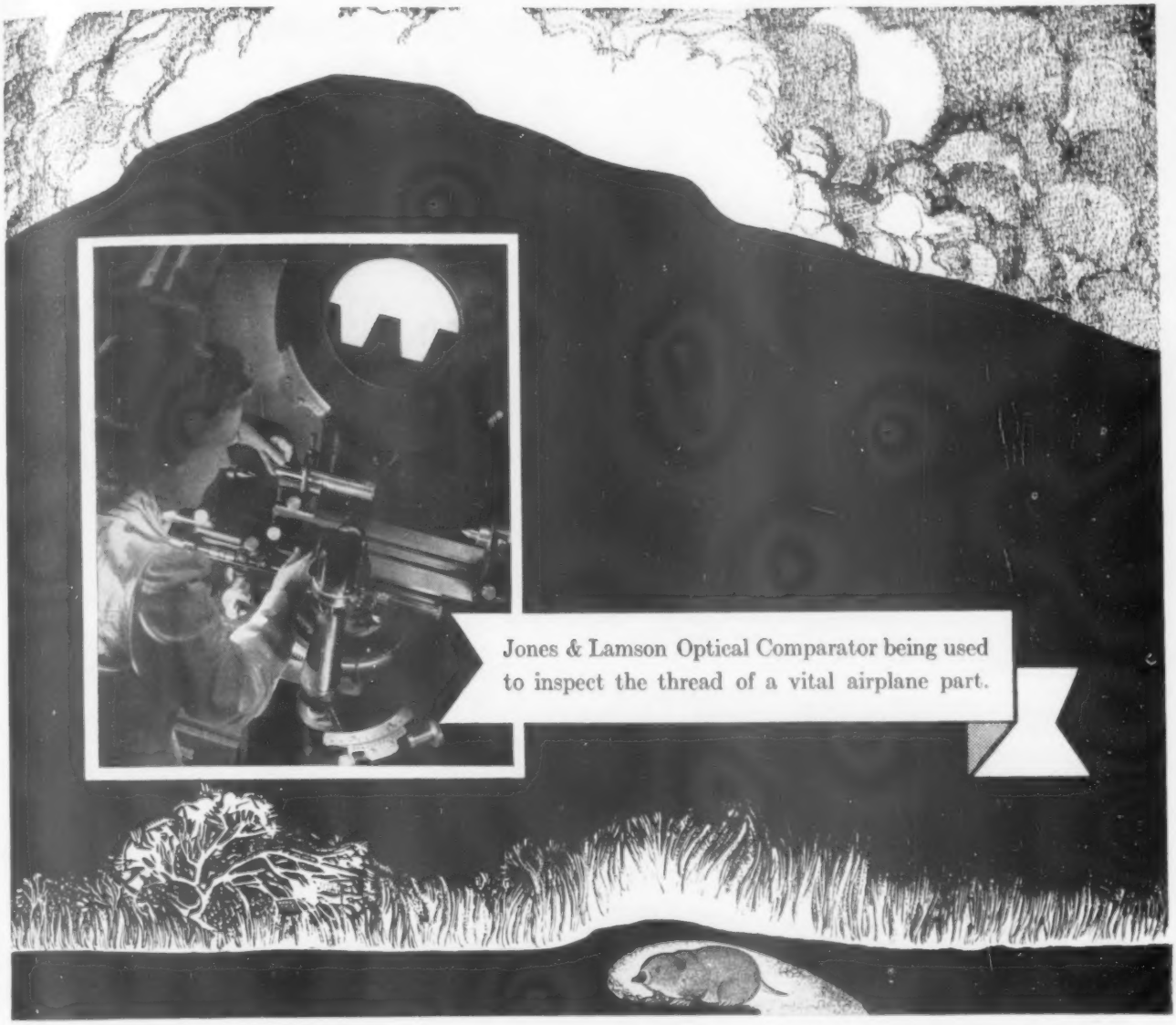
In two years of hard work Cooper-Bessemer's Meehanite tool shanks, forming tools, milling cutters and special tools have done the toughest cutting jobs, and time and again have proven superior to carbon steel shanks and steel forgings.

Carbide-tipped Meehanite tool shanks can cut faster than steel shanked tools because they dissipate heat faster, don't load up as fast, have better damping qualities. They require less machining to start with, and are easier to cut and grind. Their coefficient of expansion is nearer to that of carbide-tips than is steel's.

For testing in actual production in your own machines, send for Bulletin No. 53-T-2. Pick out tool shanks, forming tools or milling cutters to fit your needs and we will send samples for free trial. No obligation, of course. Write to The Cooper-Bessemer Corporation, Mt. Vernon, Ohio.

THE Cooper-Bessemer CORPORATION

DEPT. E., MOUNT VERNON, OHIO



Jones & Lamson Optical Comparator being used to inspect the thread of a vital airplane part.

Making Mountains out of Molehills!

There are people who *must* make mountains out of molehills. They are those who must detect and measure the microscopic irregularities that would, if undiscovered, swell scrap heaps, retard production and even endanger lives.

Jones & Lamson Optical Comparators enlarge minute imperfections to conspicuous size. By the use of the Comparator, inspectors of tools and products can *see* and *measure*, accurately and quickly, faults that might elude other means of inspection.

Jones & Lamson Optical Comparators are made in various models to meet every need. Ask Jones & Lamson inspection engineers how you can use them to expedite and improve inspection in your plant. Ask them today!

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Before Designing Hydraulic Machines

Check these TWO methods

of Obtaining Circuits . . .

METHOD ONE

DESIGN YOUR OWN CIRCUITS. . . .

Unless you have highly trained hydraulic engineers in your plant, it is costly and dangerous to design your own hydraulic circuits.

ORDER PUMPS, VALVES, ETC., FROM SEVERAL SOURCES . . .

When making selection of these elements from various catalogs and data sheets, many chances are taken in obtaining parts which can be easily assembled and made to function successfully as a complete circuit.

DIVIDED SERVICE RESPONSIBILITY. . . .

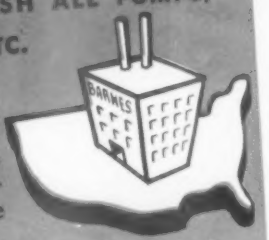
Unless the foregoing two functions have been completed successfully, the final circuit will not operate properly . . . service responsibility is difficult to determine.

METHOD TWO

HAVE BARNES DESIGN YOUR CIRCUITS . . .

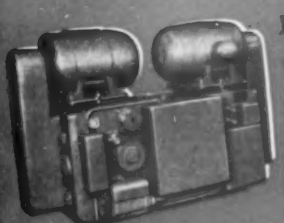
Hydraulic problems submitted to Barnes are not placed with one or two engineers, but with a staff of experienced hydraulic specialists. Barnes engineers first study the application outlined. The correct hydraulic circuit is then designed to suit your job.

HAVE BARNES FURNISH ALL PUMPS, VALVES, CYLINDERS, ETC.



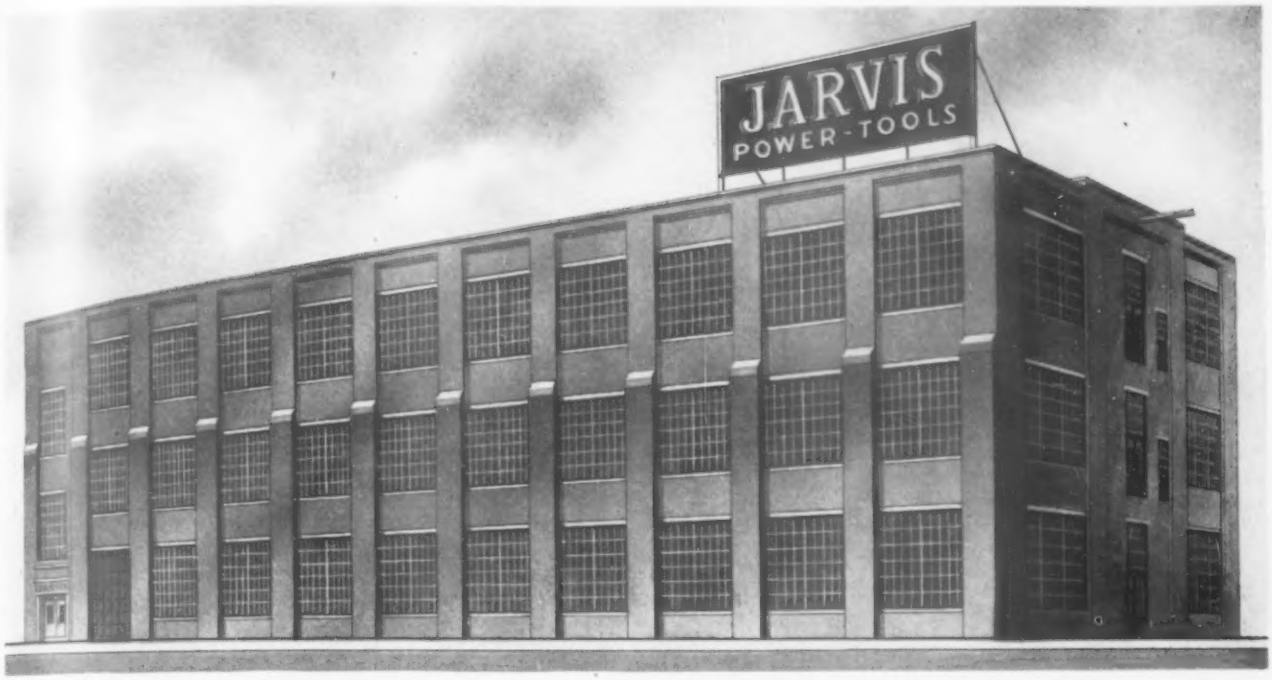
All Barnes hydraulic circuits are made up of *Barnes elements.* Pumps, cylinders, valves, reservoirs and piping come from a single source . . . the Barnes plant. Complete circuits and units are shipped, tested and ready to assemble to your machine. Simple pipe connections from unit to cylinders are all that need be made.

UNDIVIDED SERVICE RESPONSIBILITY . . .

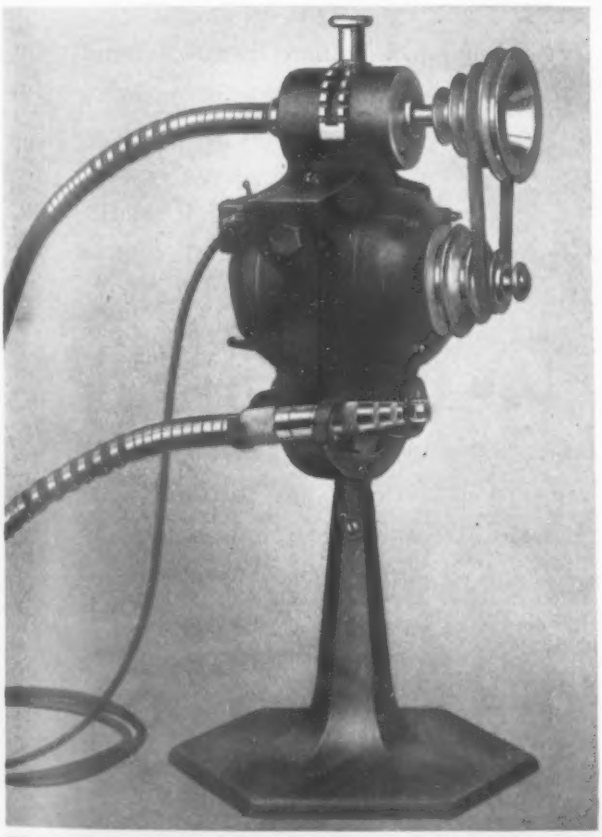


Responsibility for operation rests with Barnes alone. Barnes guarantees the application as well as all hydraulic elements. Capable service engineers are your assurance of a trouble-free hydraulic circuit. There is no division of responsibility.

John S. Barnes Corporation ROCKFORD, ILLINOIS



THIRTY YEARS OF LEADERSHIP IN THE DESIGN & MANUFACTURE OF POWER TOOLS



FLEXIBLE SHAFT MACHINES

FLEXIBLE SHAFTING

TAPPING ATTACHMENTS

QUICK CHANGE CHUCKS & COLLETS

Ground from the Solid HIGH SPEED ROTARY FILES

All above mentioned Jarvis products are manufactured in the modern Jarvis plant. Jarvis Power Tools are recognized as the standard of the industry. Write for latest catalog.

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES
QUICK CHANGE CHUCKS AND COLLETS

How you can

CUT the COST of PRECISION

Looking into the near future, it is easy to see that the new and precise standards of accuracy of the past few years will become regular practice in all industry.

And yet competition will demand that these standards be maintained at low production cost.

For help in meeting this situation

Use PM Cutting Tools

PM Inserted-Blade Milling Cutters and Ground-Thread Multiple Thread Mills have proved their ability to turn out long production runs with accuracy of dimension maintained from start to finish. Their sound design and careful building insures longer effective life without loss of precision.

Use PM Gages

Gages bearing the PM Diamond Emblem promise you the utmost in accuracy, and then live up to that promise. Careful finishing slows down gage wear and helps you uphold high standards and close tolerances.

When you retool for new production, let Pipe Machinery engineers help you.

PMCO

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • JIGS • MILLING CUTTERS • SPECIAL TOOLS

For Hitting the "Pinpoint" from Five Miles Upstairs

Microhoning Provides Vital Precision Bearings in Wartime Production

High altitude bomb sights need a certain number of bearing surfaces of almost perfect precision accuracy and surface finish. The amazing accuracy of our bomb sights depends on this near-perfect accomplishment.

The thousands of these bomb sights needed made it necessary to achieve this fine instrument precision at production speed.

Ordinary machining practice can't produce such results—and fine instrument methods just aren't fast enough.

Microhoning bridged the gap. By means of this highly controlled abrading process, the extreme precision needed was obtained at production rates.

This modern final machining process will generate dimensional accuracy to "tenths" and fractions of "tenths", and provide any desired surface finish. It is applicable to the bores of these bomb sight bearings as it is to highly loaded gun turret bearings.

Precision Microfinish Honing will make many important contributions in postwar processing and Micromatic engineers will be ready with many new honing developments.

MICROMATIC
HONE CORPORATION
DETROIT 4, MICHIGAN

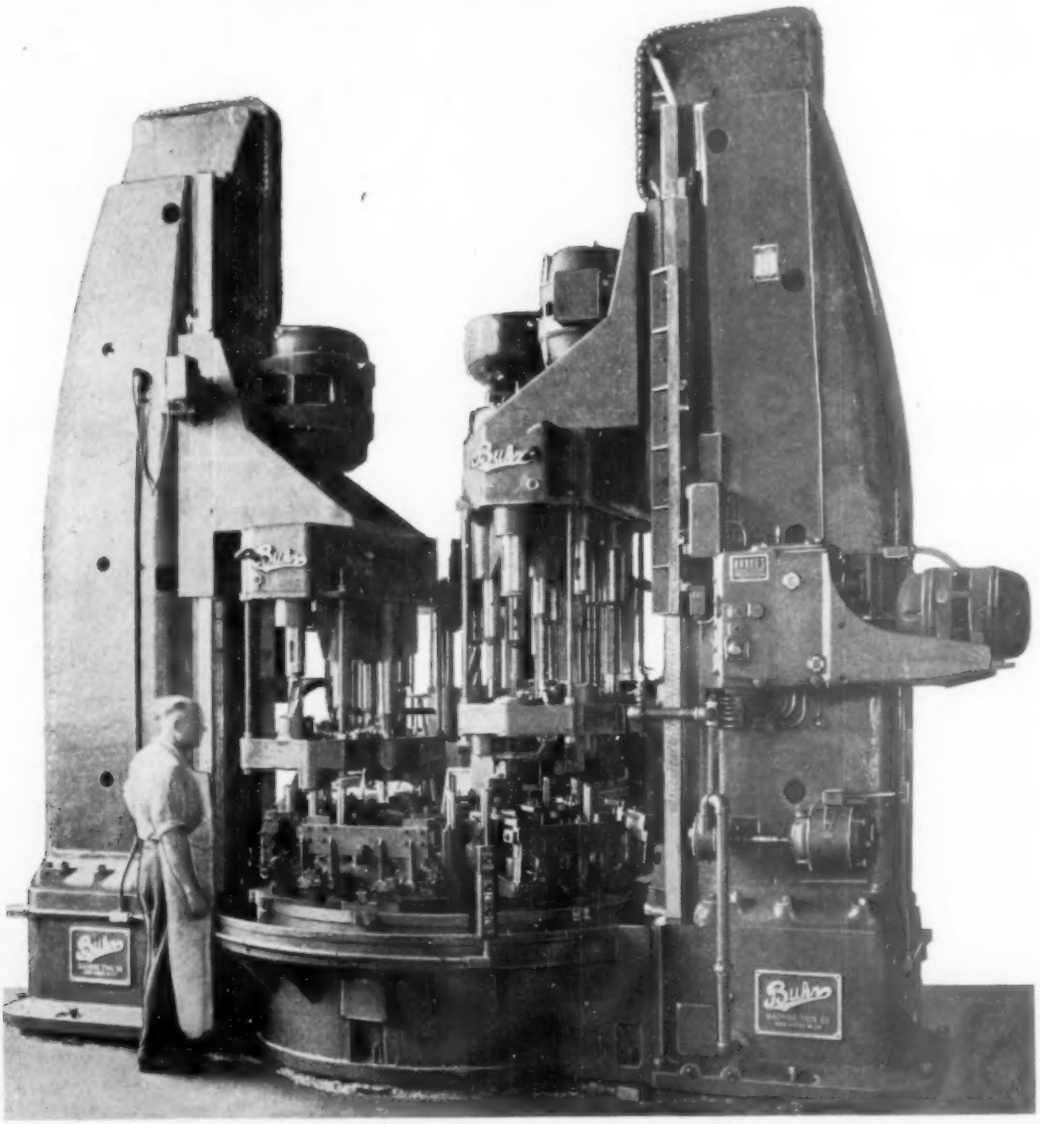
MAKERS OF HONING MACHINE TOOLS

A Buhr CONVERSION

OF THREE STANDARD MACHINES BY BUILDING NEW

1 — 6-station, 72″ automatic index table base with a compound tank.
3 — Sub-bases for columns.
6 — Holding fixtures mounted on index table.
1 — 6-spindle drill head and bushing plate.
1 — 2-spindle drill head and bushing plate.
1 — 8-spindle reaming head and bushing plate.

For drilling and reaming 2⅞ and 3½ holes in a tank suspension arm.



BUHR MACHINE TOOL COMPANY

833 GREEN STREET

ANN ARBOR MICHIGAN

Ever count the leaves on a tree? Of course not! But better look close at our picture. It is an accurate diagram of the combinations that can be made up out of the assortment of holders, cutters, and pilots contained in one Gairing Interchangeable Counterbore set. • For a wide range of counterboring, countersinking and spot-facing operations this adds up to great economy and efficiency. Expensive delays due to lack of proper tools are greatly reduced.

Yes, 281 different tools can be made from Counterbore Set C-13 shown below. All parts can be quickly replaced from stock. Complete in wooden case with hinged cover $232.20.

Six other sets are available ranging from $45.90, both in Morse Taper and straight shank type. For full description and prices write today for our Counterbore Bulletin.

The Gairing Tool Company, Detroit, 32, Michigan.

GAIRING

Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools

AROUND THE PLANT with DoALL

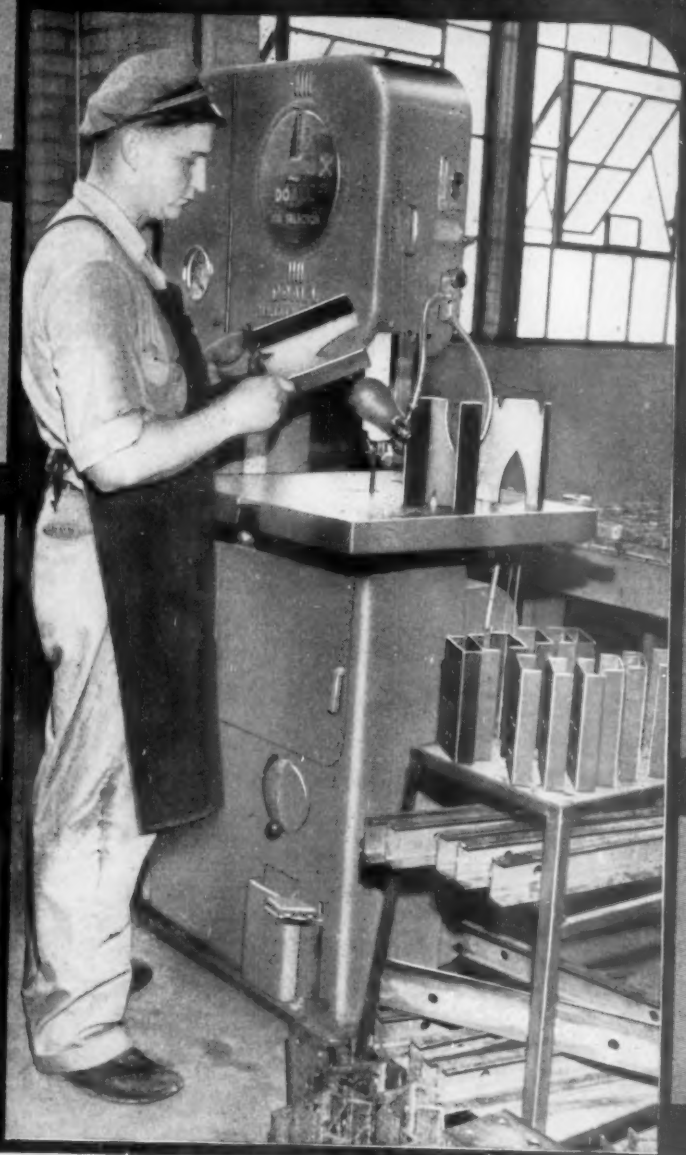
CONTOUR MACHINING — Today's fastest, most economical method for shape cutting. DoALLs in every department provide a hundred short cuts to increased production.

EXPERIMENTAL LABORATORY
New shapes made on the DoALL in a jiffy.

TOOL & DIE DEPARTMENT
Special tools, dies, jigs, expertly cut and finished.

FOUNDRY
Slicing risers and lugs from castings clean as a whistle.

SHEET METAL DEPARTMENT
20 to 100 shapes cut at one time from stacked sheets.



MACHINE SHOP
All kinds of production cutting, straight line or contour.

FINISHING DEPARTMENT
Equipped with File or Polishing Bands, DoALLs do precision finishing.

MOBILE UNIT
Mounted on a truck, for emergency or repair work anywhere in shop or yard.

DoALL

INDUSTRY'S NEW SET OF TOOLS

You will find our 285-page Handbook on Contour Sawing interesting. Write for your free copy.

CONTINENTAL MACHINES, INC.
1304 S. Washington Ave. • Minneapolis 4, Minn.

Sales & Service Offices: Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Erie, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Pittsburgh, Rochester, Rockford, St. Louis, San Francisco, Seattle, Toledo, Tulsa, West Hartford.

A plain plug or ring gage, worthy of the name, must have a hard, durable surface, mirror finish and a uniformly smooth face that can withstand the microscopic scrutiny of the surface analyzer.

Achieving this perfection is not easy. Grinding the plug or ring down to the right amount of lap stock requires that intangible quality known in shop parlance as "feel". Lapping the minute grind ridges down to an even, durable surface and, at the same time, holding the dimension within tolerance, is another example of "feel".

Highly skilled craftsmanship plus a constantly controlled precision inspection—that is the Vinco formula for producing a perfect cylindrical gage.

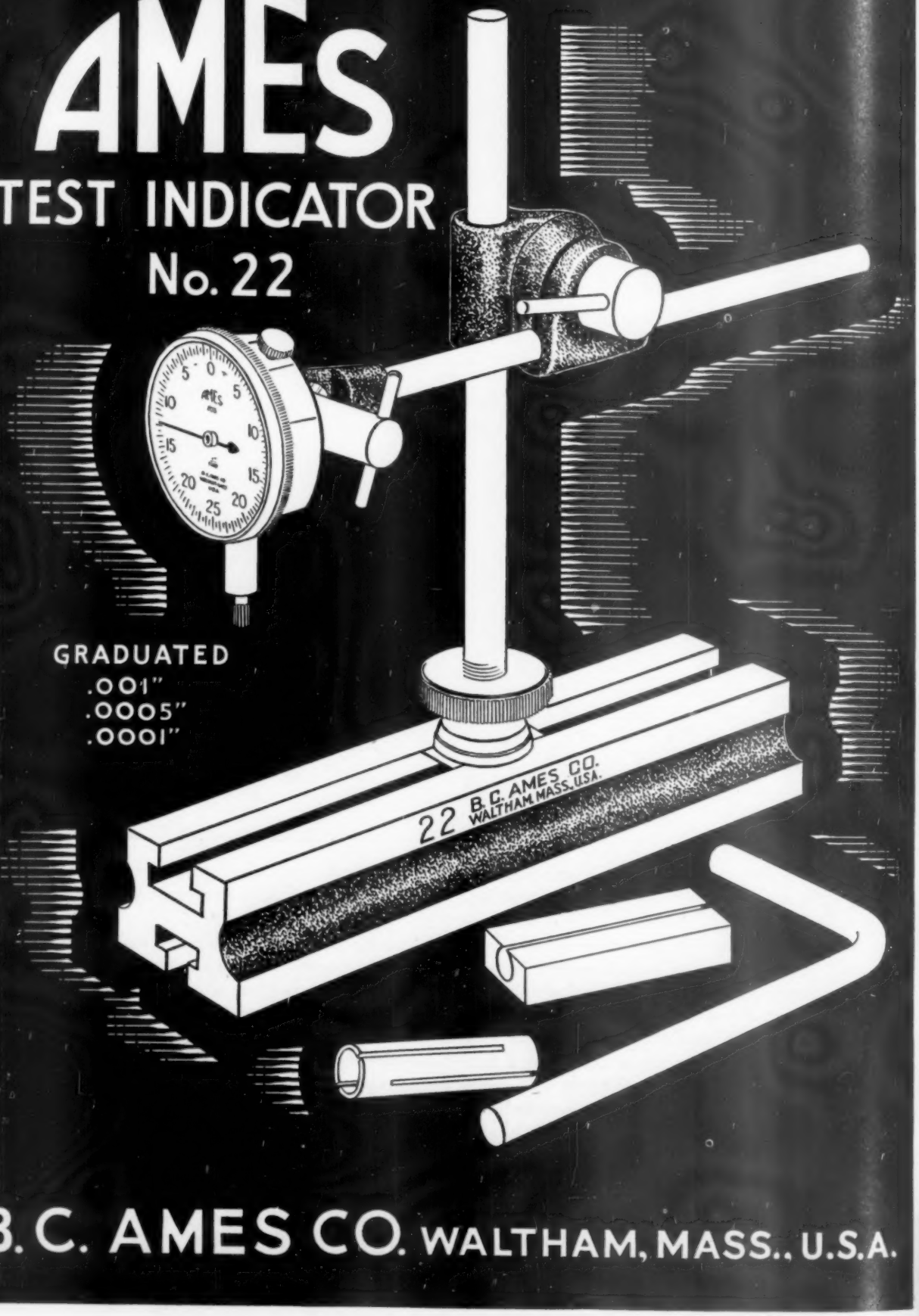
Don't let the simplicity of cylindrical design swerve better judgment. A perfect cylindrical gage is a sound investment. To insure that investment, buy Vinco.

VINCO CORPORATION, 8857 SCHAEFER H'W'Y, DETROIT 27, MICH. SALES OFFICES: NEW YORK, CHICAGO, CLEVELAND

MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

AMES
TEST INDICATOR
No. 22



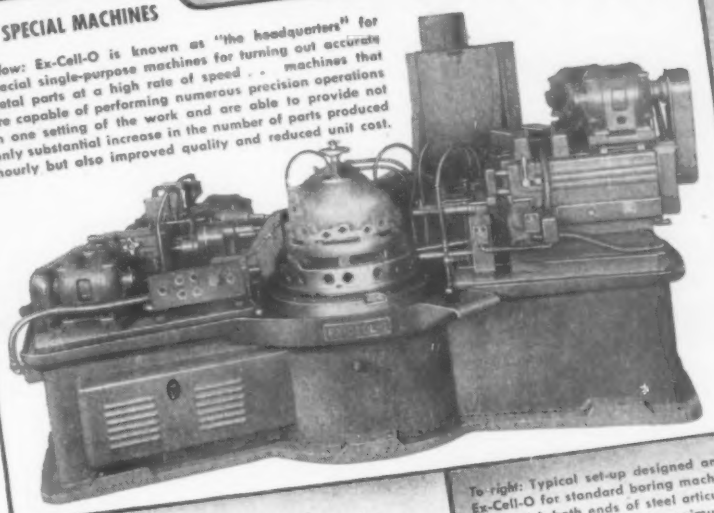
GRADUATED
.001"
.0005"
.0001"

B. C. AMES CO. WALTHAM, MASS., U.S.A.

A File of EX-CELL-O Production Aids

SPECIAL MACHINES

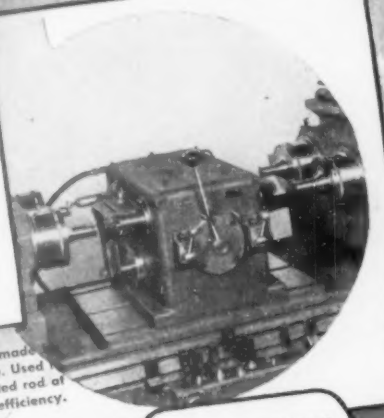
Below: Ex-Cell-O is known as "the headquarters" for special single-purpose machines for turning out accurate metal parts at a high rate of speed . . machines that are capable of performing numerous precision operations in one setting of the work and are able to provide not only substantial increase in the number of parts produced hourly but also improved quality and reduced unit cost.



STANDARD MACHINES

Ex-Cell-O precision machine tools—for boring, turning, facing, thread grinding, broach sharpening, tool grinding, lapping—are sound in design and construction. The simplicity of their operation and the substantial production they attain on an economical basis, make these Ex-Cell-O standard machines of practical interest to both the manufacturers who install them and to the men who operate them.

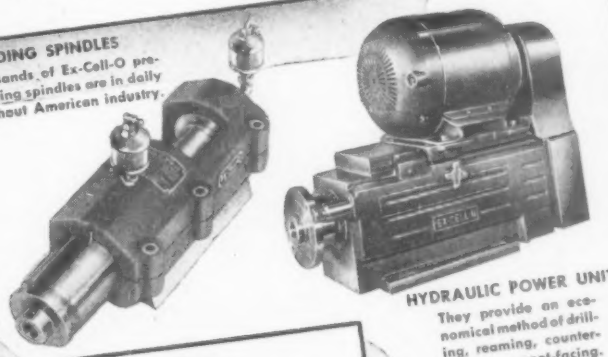
FIXTURES



To right: Typical set-up designed and made by Ex-Cell-O for standard boring machine. Used to semi-finish both ends of steel articulated rod at a high production rate with maximum efficiency.

GRINDING SPINDLES

Many thousands of Ex-Cell-O precision grinding spindles are in daily use throughout American industry.

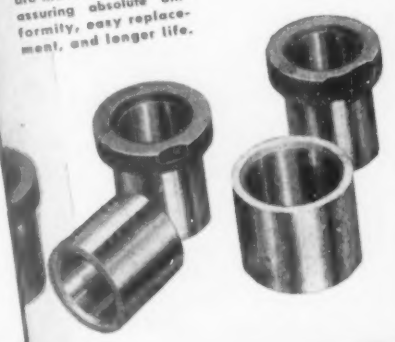


HYDRAULIC POWER UNITS

They provide an economical method of drilling, reaming, countersinking or spot-facing. Also may be used as prime movers or drivers for other machine units

DRILL JIG BUSHINGS

Ex-Cell-O drill jig bushings (A.S.A. Standards) are made with accuracy, assuring absolute uniformity, easy replacement, and longer life.



CONTINENTAL STANDARD and SPECIAL CUTTING TOOLS (High Speed and Carbide)

IN your production plans for now and the future, take advantage of Ex-Cell-O's substantial background of practical engineering experience in the designing and manufacture of precision machine tools and Continental cutting tools. Send for your free copy of General Products Folder No. 27132.

EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

XLO
EX-CELL-O *for* PRECISION

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH GRINDING MACHINES • HYDRAULIC POWER UNITS GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK MILK CONTAINER MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

There won't be any Sharp line drawn

WAR industries are too big to stop at a common finish line. Peace industries are too big to resume at a common starting line.

There may be months of overlapping schedules even in a single plant! Certainly no single V Day for all manufacturers together.

When you reconvert it will be your decision —what you will make, and *when* you will make it.

But it may be our privilege to help you with the HOW. And what is more vital, to help you answer the question, "How much will it cost?"

Here are several National Acme Publications designed to help you produce *more for less.*

Write us—on your company letterhead—for any of them.

BULLETIN CM-43
"Multiple Spindle Chucking Automatics"

BULLETIN CM-44
"How Costs Were Cut on 25 Chucking Jobs"

CATALOG D-42-B
Automatic Dies, Collapsible Taps and Hollow Mill Heads

Other Publications on Multiple Spindle Bar Automatics, Snap-Lock Limit, Motor Starter and Station Control Switches, Solenoids, Centrifuges.

THE NATIONAL ACME CO.

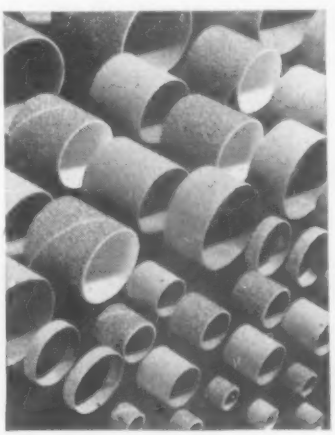
170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

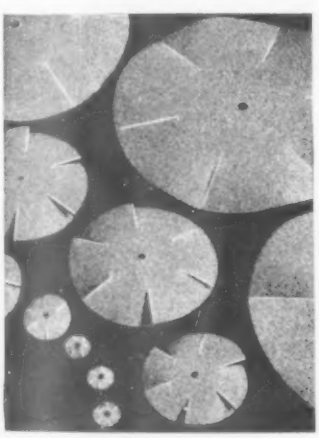
WE CALL THEM "WEAPONS FOR PRODUCTION"

THESE coated abrasive products by Carborundum so speed up and improve the finishing of a thousand and one metal parts that they have contributed mightily to the war effort. There are plenty of jobs on which they can be used in your plant.

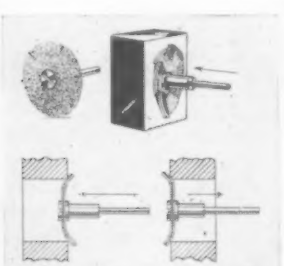
"ALOXITE" CLOTH CARTRIDGE ROLLS—for cleaning, polishing out-of-the-way surfaces. Made in straight or tapered forms 3/8 to 1 inch diameter, 1 to 2½ inches long.



"NOLAP" ABRASIVE BANDS—spirally wound, no overlapping splice. For a multitude of polishing jobs on small and intricate parts. Diameters ¼ to 3 inches, widths ½ to 3 inches—wide range of grits.



MULTI-SLOTTED DISCS—for removing burrs, breaking down edges of holes—fast cutting—flexible—durable.



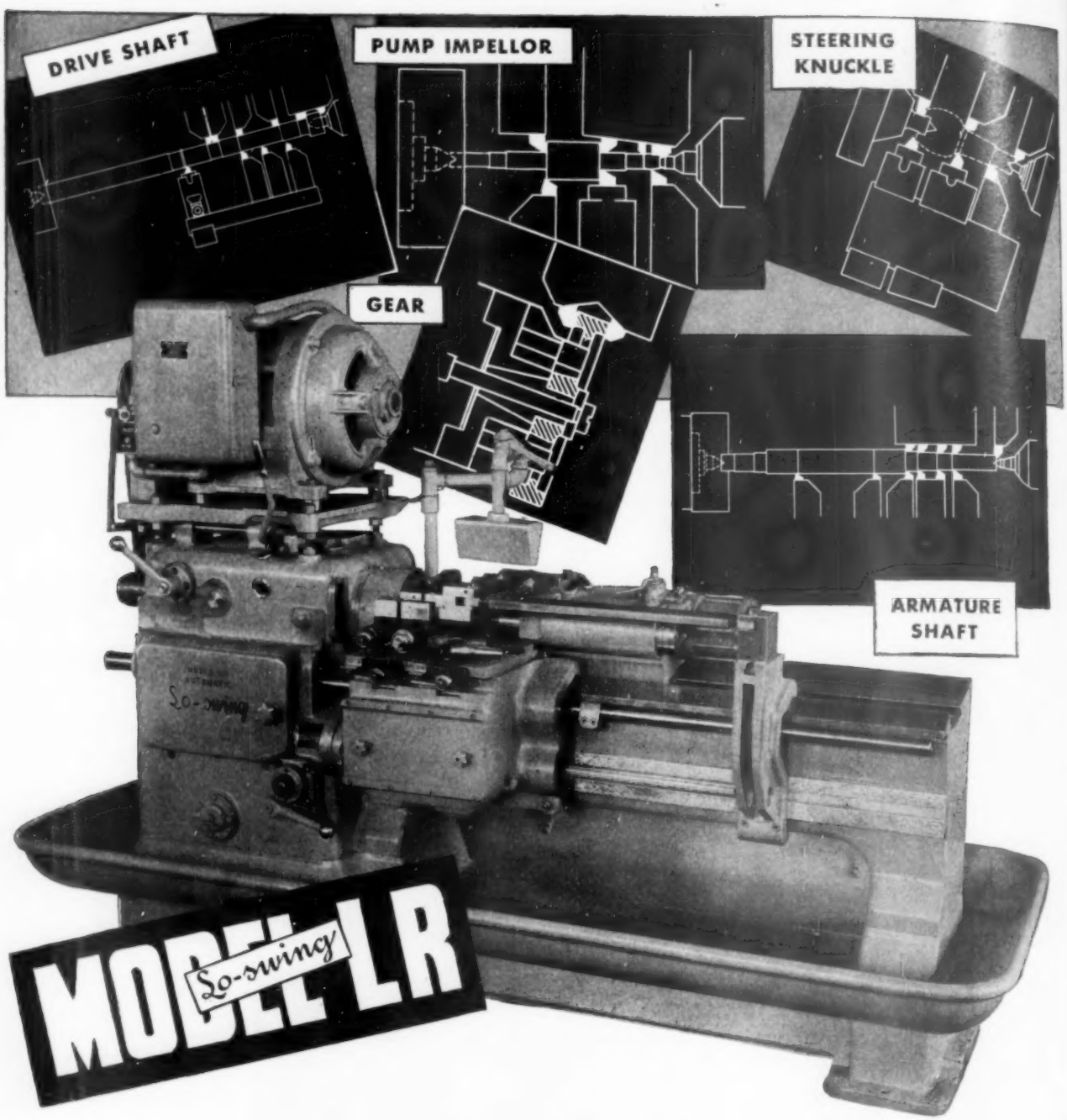
"ALOXITE" CLOTH—no end to the number of metal finishing jobs to be done with this abrasive cloth—in 9 x 11 inch sheets—in "Economy" Rolls.

Coated Abrasives by Carborundum of course, include all types of metal finishing discs and belts. Send for illustrated booklet. The Carborundum Company, Niagara Falls, N. Y.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Buffalo, Pittsburgh, St. Louis, Cincinnati, Grand Rapids

Coated Abrasives by CARBORUNDUM TRADE MARK

(Carborundum, Aloxite and Economy are registered trade marks of and indicate manufacture by The Carborundum Company)



ACCURACY AT LOW PER-PIECE COST

● The Model LR Lo-swing has demonstrated its ability to cut costs on a wide variety of work demanding consistent accuracy at high speeds. Its field includes practically any work within its capacity, and up to 46″ between centers in the longest bed length. It is designed to provide maximum efficiency with carbide tools.

Model LR is a versatile lathe in that it may be equipped with either direct V belt drive to the spindle for high speed, fine finishing cuts, or a geared drive with pick-off gears for slower roughing cuts. It may also be equipped with a third slide (over-head) as well as additional back squaring attachments, carriages and carriage slides, making for innumerable tooling possibilities.

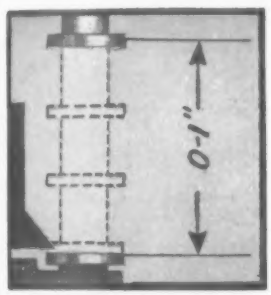
Write for Bulletin on this modern, automatic lathe. Send in your blueprints for estimates.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

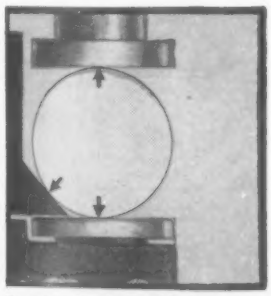
LATHE NEWS *from* SENECA FALLS

Why Not SEE Rather than feel

Weight of Gage and operator's hand rests upon the fixed contact. Gage is only 5/8" wide.



The upper or reference contact is adjustable to any dimension within one inch.



Backstop locates work in center of contacts and is adjustable for size.

A light thumb pressure retracts the sensitive contact. Work surface is not marred. The contact movement is transferred direct to Indicator.

FEDERAL

INDICATOR SNAP GAGE *with-Retractable Anvil Adjustable for Size No Lost Motion*

This Model 1330 P-100 Visual Dial Indicator Snap Gage marks a decided step ahead in gaging practice. Conventional type, fixed or solid snap gages depend upon "feeling", and personal variations in the sense of touch influence the inspection accuracy. But, you **see** with this.

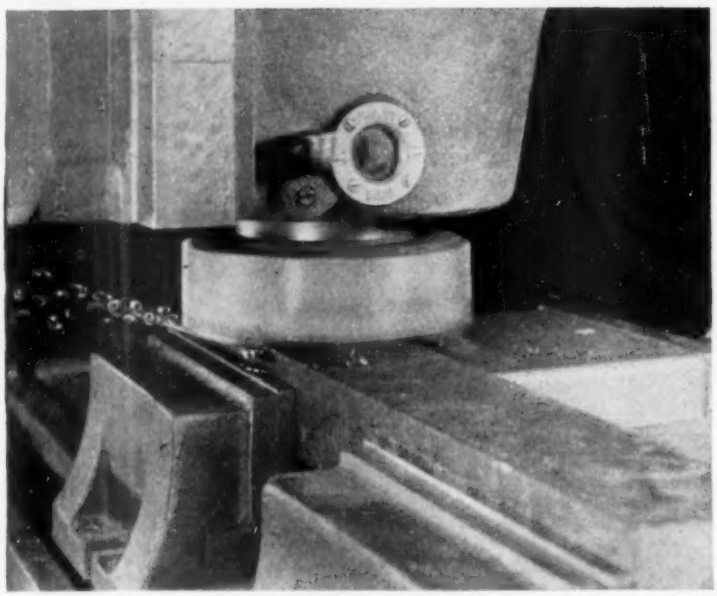
The Model 1330 P-100 has other advantages too — **The retractable anvil** makes it easier to apply, and it eliminates all excuses for marring the surface of highly finished workpieces. **It is easily adjusted** to any dimension within one inch and locked in place. **There is no lost motion.** The movement of the sensitive contact is transferred directly without error to the Dial Indicator. **The weight of the Gage and the inspector's hand rests upon the fixed or reference contact. It is thin:** only 5/8". It is small; not over 6" at the longest point. It is light; weighs only 15 ozs. It reads in tenths (.0001"). Contacts are hard wearing Norbide (Made by Norton Co.) For more details concerning this modern snap gage write

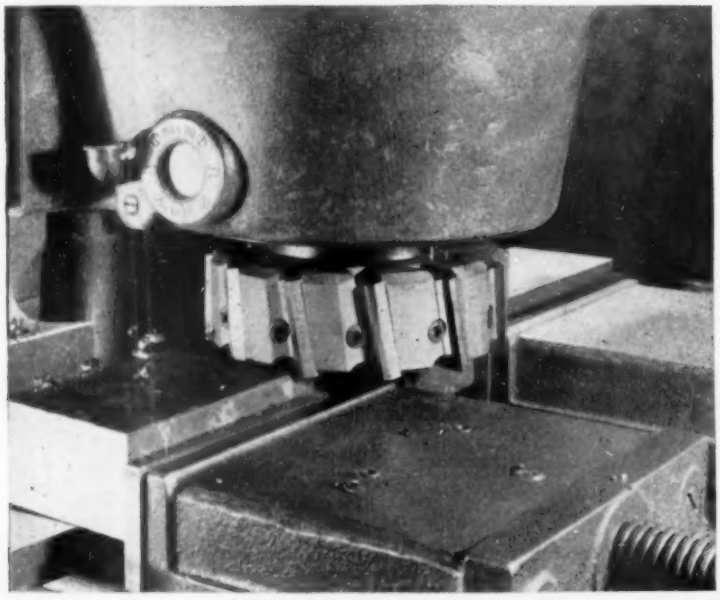
FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET PROVIDENCE 1, R. I.

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

INGERSOLL *Negative Angle*





CARBIDE TIPPED CUTTERS

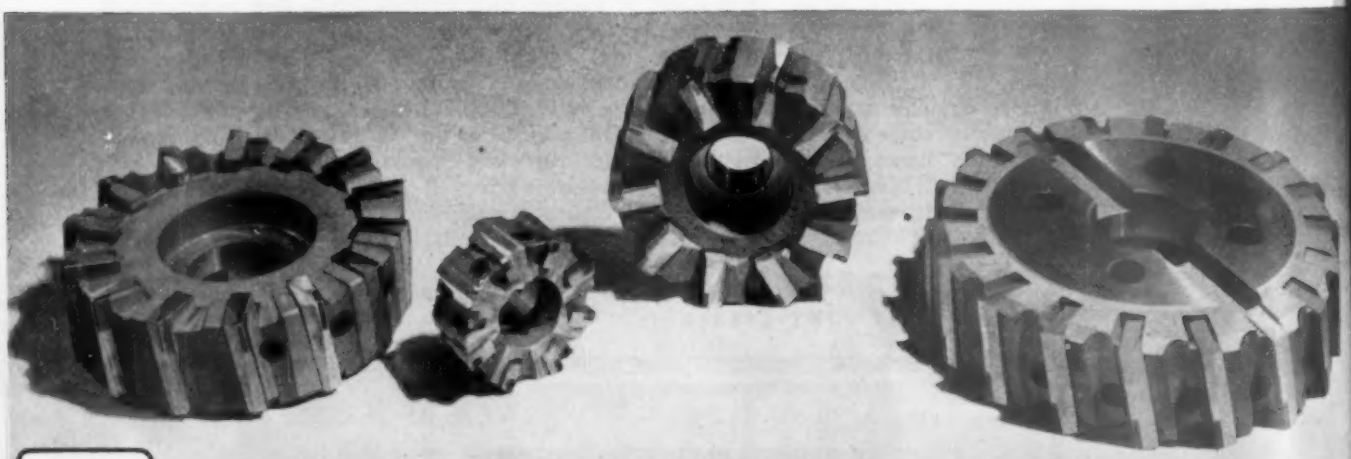
Negative angle cutters are no longer a fad. They represent a real advancement in steel milling practice. Removing 3/16" stock at 42 in./min. feed with mirror finish as illustrated is but one of many successful Ingersoll applications.

This process of milling steel with carbide is not a cure-all. It must be applied only under very rigid conditions of both machine and fixture. Results depend largely on the equipment used. We suggest that you purchase an Ingersoll negative angle cutter for experimenting on your work. This is the only way to fully appreciate the possibilities of higher feeds and longer tool life with high polished finish.

Standard Ingersoll negative angle cutters are listed below. Variations with different tooth spacing are available where conditions warrant.

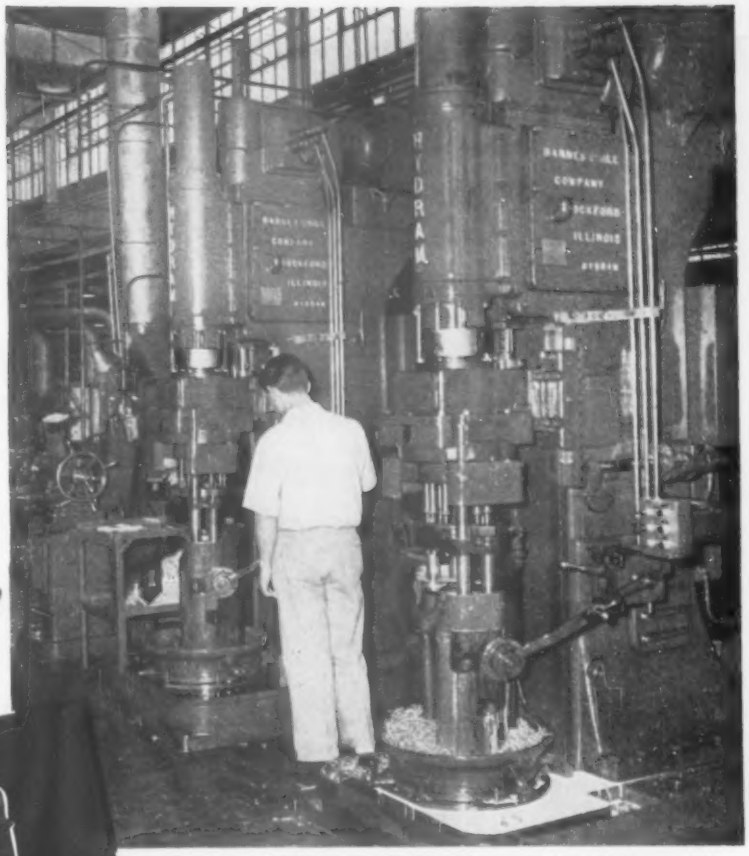
CUTTER NO.	DIA.	TEETH	PRICE
98104X	4	6	$46.00
98106X	6	8	52.00
98108X	8	12	70.00
98110X	10	14	95.00
98112X	12	16	115.00

Send for a copy of "Ingersoll Engineering Specification Sheets" describing our complete line of standard inserted blade milling cutters.



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

HOW STANDARD BARNESDRIL HYDRAMS WITH SPECIAL TOOLING increased production 7.4 times!



(Above) *View of two* BARNESDRIL *Standard H-3 Hydrams with 12-spindle auxiliary heads and indexing fixtures.*

(Right) *Front view of* BARNESDRIL *H-4 Hydram Drilling Machine.*

Three Sizes Available

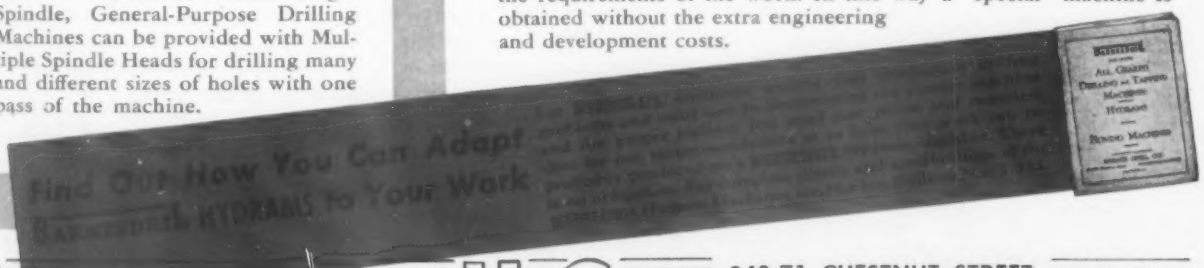
BARNESDRIL Hydram Drilling Machines for drilling, reaming, facing, and counterboring operations are available in 3 sizes. The H-2 Hydram Machine has a drilling capacity of 2″ diameter in any material, the H-3 Hydram will drill up to 3″ in diameter in any material, and the H-4 Hydram has a 4″ diameter capacity in solid drilling, while cast-iron can be bored and reamed up to 8″ in diameter. These Single Spindle, General-Purpose Drilling Machines can be provided with Multiple Spindle Heads for drilling many and different sizes of holes with one pass of the machine.

Saves 35.7 Production Hours and 4 Operators

This installation of two BARNESDRIL Standard H-3 Hydrams equipped with 12-spindle auxiliary heads and indexing fixtures for drilling and reaming aircraft parts is an excellent example of the savings possible by using standard BARNESDRIL machines with special tooling head and fixtures. On this job, one machine is used for drilling 24 holes in the flange of a propeller shaft, while the second machine reams these holes.

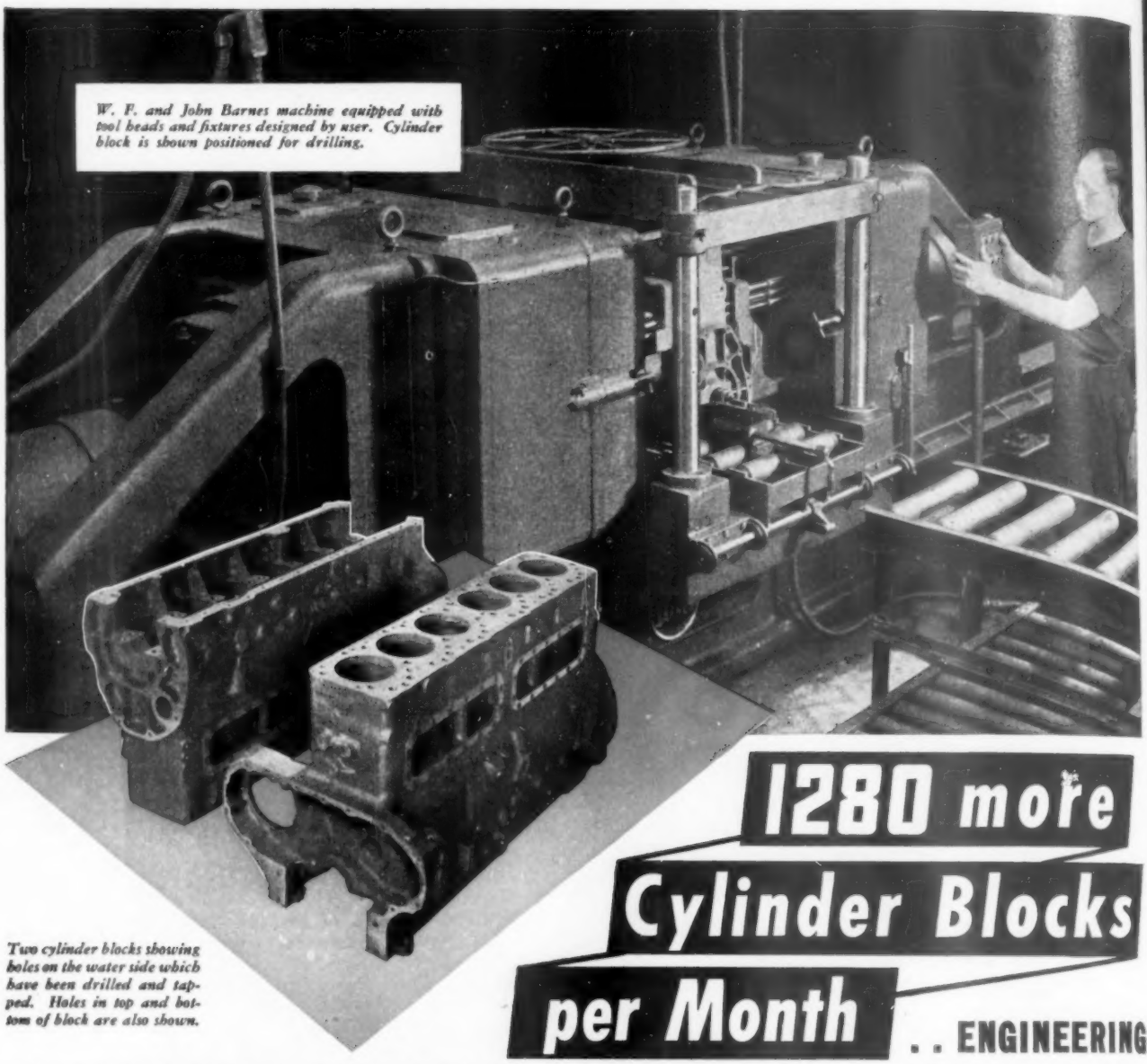
These operations were formerly done on two standard radial drills requiring 6 operators. With two BARNESDRIL Standard Machines only 2 operators are required. On a 3 shift day, time was reduced from 41.3 production hours to 5.6 on the same number of propeller shafts per day.

These savings were possible at no extra investment cost to the user since the cost of this standard machine with special tooling was exactly the same as the cost of standard radial drills with fixtures. These savings in cost are possible by using a standard machine and merely adapting a special drilling head and indexing fixture to meet the requirements of the work. In this way a "special" machine is obtained without the extra engineering and development costs.



848-71 CHESTNUT STREET

Barnes Drill Co. ROCKFORD ILLINOIS, U.S.A.



W. F. and John Barnes machine equipped with tool heads and fixtures designed by user. Cylinder block is shown positioned for drilling.

Two cylinder blocks showing holes on the water side which have been drilled and tapped. Holes in top and bottom of block are also shown.

1280 more Cylinder Blocks per Month . . ENGINEERING

COLLABORATION BETWEEN MANUFACTURER AND USER PRODUCES MACHINE WHICH MORE THAN DOUBLES PRODUCTION

FREE *These useful booklets show how W. F. and John Barnes machines are designed to meet specific requirements. Boring, drilling, reaming, tapping and milling operations can be done simultaneously. Each booklet may suggest a tooling or production set-up you can use today. Write now—ask for Bulletin No. 944*

W. F. & JOHN BARNES

● Here is an interesting example of how a large motor manufacturer collaborated with our engineers in designing and building special machine tools to suit their job. As a result, cylinder block drilling was increased from 720 blocks per month to 2,000 blocks per month. In addition to increasing production, one Barnes machine with one operator replaced six single spindle drilling machines.

This manufacturer uses three Barnes machines in his production line. Drilling and tapping heads on these machines are of his own design. One machine drills holes on both water side and valve side simultaneously. The second machine is used to tap all holes on both sides of the block, except the angular holes. The third machine taps all holes on top and bottom of block. Roll conveyors and small power hoists are used to handle the blocks from one machine to the other.

You may be confronted with similar problems. Our designers will be glad to collaborate with you in designing a machine for your needs. Submit your machining problems to us for recommendation. There is no obligation.

W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

HOT News on a COLD Subject!

Threadwell COLD-TEMPER Taps

ONE HUNDRED AND TWENTY BELOW—the temperature at which Threadwell **Cold-Temper** Taps are treated—nevertheless generates the hottest thread production news of the day!

Threadwell **Cold-Temper** Taps have supreme resistance to wear. They're harder yet more ductile than ever. They're ideal for tapping plastics or abrasive metals. They guarantee you more and better threads at lower cost.

Superior performance and longer life are frozen into Threadwell **Cold-Temper** Taps for keeps. There's a sound and scientific metallurgical basis for it (which we'll gladly explain, if you're interested) but the *results* in your own shop will interest you most. Ask your Threadwell distributor or write us at the factory for the cold facts on Threadwell **Cold-Temper** Taps.

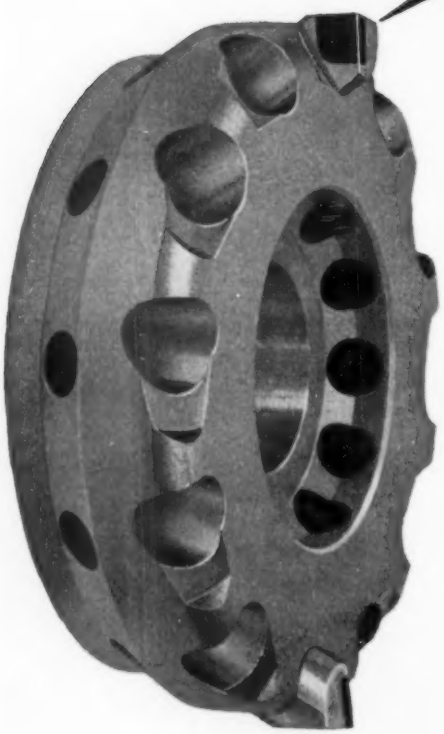
DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA
EXPORT STOCKING DISTRIBUTORS
CANADA, Bridge Machinery Co., Montreal; ENGLAND, Skylux Ltd., London and John H. Graham and Co., Inc. THROUGHOUT THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY · GREENFIELD, MASSACHUSETTS, U. S. A.

Fly Cutters

PROVE the superiority of Lovejoy Milling Cutter Construction

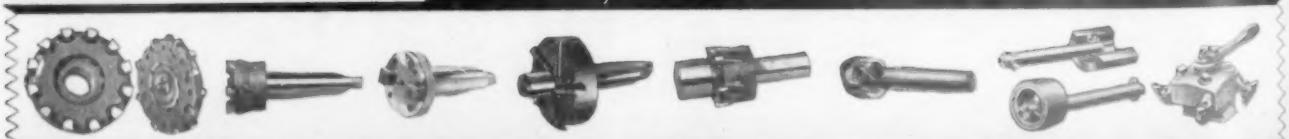


We have often said that Lovejoy inserted-blade Milling Cutters approach solid steel mills in compactness and strength. When used as fly cutters, the Lovejoy Mill proves this statement, because even if *only one carbide-tipped blade* is used in a Lovejoy, *no dummy blades are required in the mill to retain the strength of the body!* This also applies, of course, when two or more blades are used.

If you have not done this to your Lovejoy mills, we recommend that you give it a trial—it will not only pay off in accuracy and high production, but it will save the time ordinarily spent in inserting dummy blades in the housing.

Whether used in the regular way or as fly cutters, Lovejoy mills, with positive-locking blades, will give complete satisfaction on every application. Have you seen Catalog No. 26? It's free on request.

Lovejoy TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.



MILLING CUTTERS · BORING HEADS · ARBORS · SPOT FACING TOOLS · COUNTERBORES · BORING BARS · SINGLE POINT TOOLS · TURRET TOOL POSTS

"STRUCTURE" CONTROL *by* OILGEAR

In Famed Direct Casting Process

Another Typical Example of the Versatility of this Universal Power Medium

Most successful of all continuous casting methods, on the basis of tonnage produced*, is the famous "Direct Casting" process which "has long been the object of a lively multilateral interest." Here, Oilgear Fluid Power, the versatile method of applying and transmitting power, is used . . . not only to tilt the pouring ladle and to move the hydraulic lowering table, but to provide the crucial control of lowering speed which in part determines the metallurgical structure of the alloy being cast.

The success here of Oilgear Fluid Power—used in almost *every* Direct Casting machine in the country—is another typical example of the fact Oilgear Fluid Power can be used in limitless ways and to solve an endless variety of power and transmission problems. Regardless of what your machine or process power problem is, you should investigate Oilgear Fluid Power . . . now, while there is still time for such preliminary work. Why don't you outline your needs to Oilgear engineers . . . today? THE OILGEAR COMPANY, 1308 W. Bruce St., Milwaukee 4, Wisconsin.

*The Iron Age, February 24, 1944, pages 56 to 65.

OILGEAR

Type of Oilgear Fluid Power equipment used not only to tilt pouring ladle in Direct Casting Process but to lower hydraulic table below molds at rate of speed required to produce the proper rate of ingot cooling, hence, metallurgical structure . . . a dramatic example of the unique speed control Oilgear affords.

ARE YOU TRYING TO:

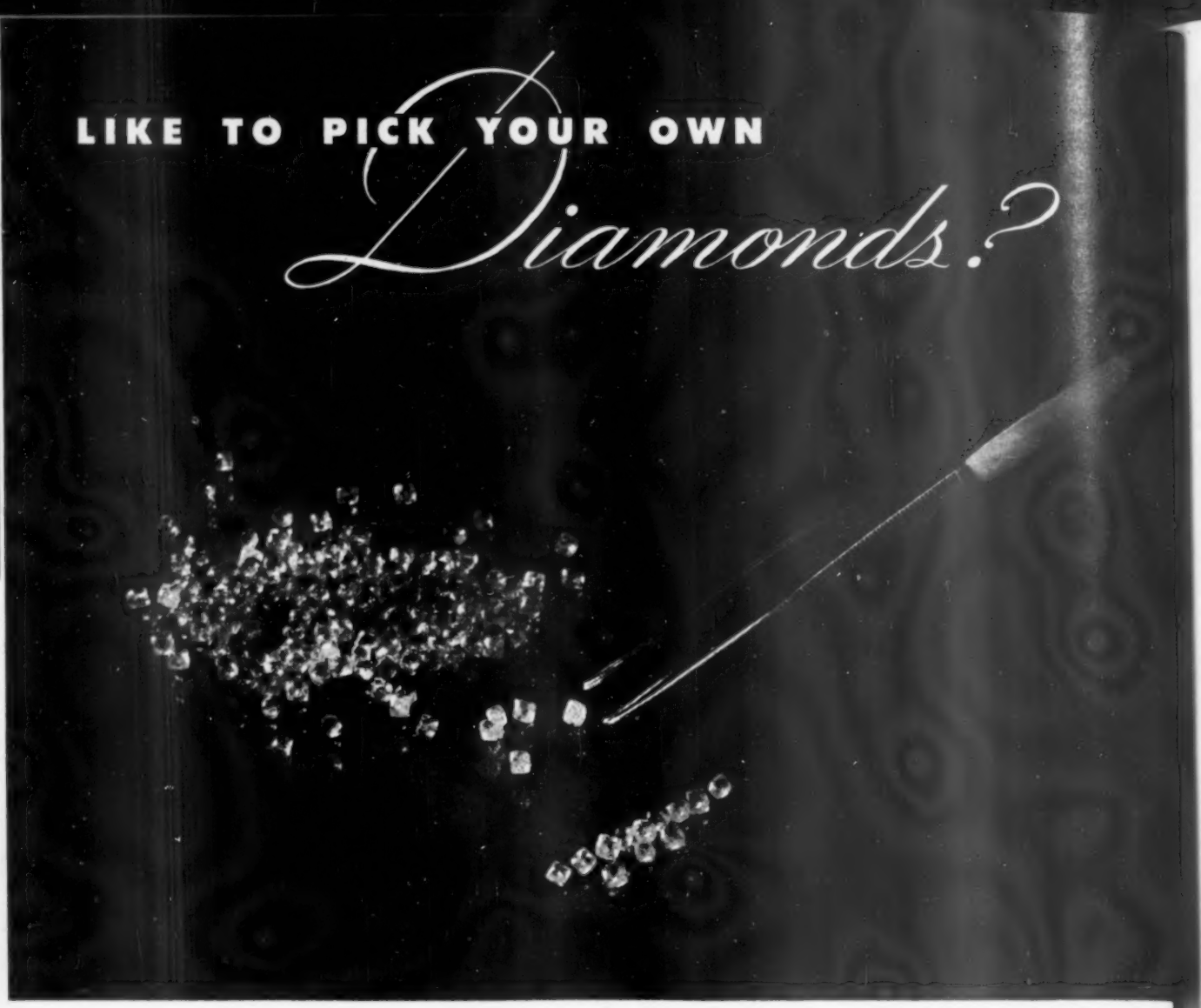
1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without preset time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

Fluid Power

LIKE TO PICK YOUR OWN *Diamonds?*



Get a selection from Wheel Trueing's big stock . . . choose those you want and get exactly the kind of diamonds you prefer.

While the introduction of highly specialized engineered diamond tools (which Wheel Trueing pioneered) has done much to change buying habits, there are still plenty of diamond-wise production men, purchasing agents and heads of grinding departments who thoroughly understand the characteristics of diamonds, who are competent buyers and who still prefer to select unmounted stones.

Many of these experienced buyers have bought their diamonds from Wheel Trueing for a third of a century or more and in many instances leave the selecting of diamonds for their needs entirely in the hands of Wheel Trueing.

With Wheel Trueing sales offices located strategically throughout the country, it is an easy matter for us to get diamond assortments to you for your inspection and selection and you will find in every Wheel Trueing diamond assortment, the high quality that results in worth-while production economies.

Your inquiry will receive prompt attention.

Send for a copy of our booklet "Tips on Using Diamond Tools." You'll want copies for all your operators.

WHEEL TRUEING TOOL COMPANY

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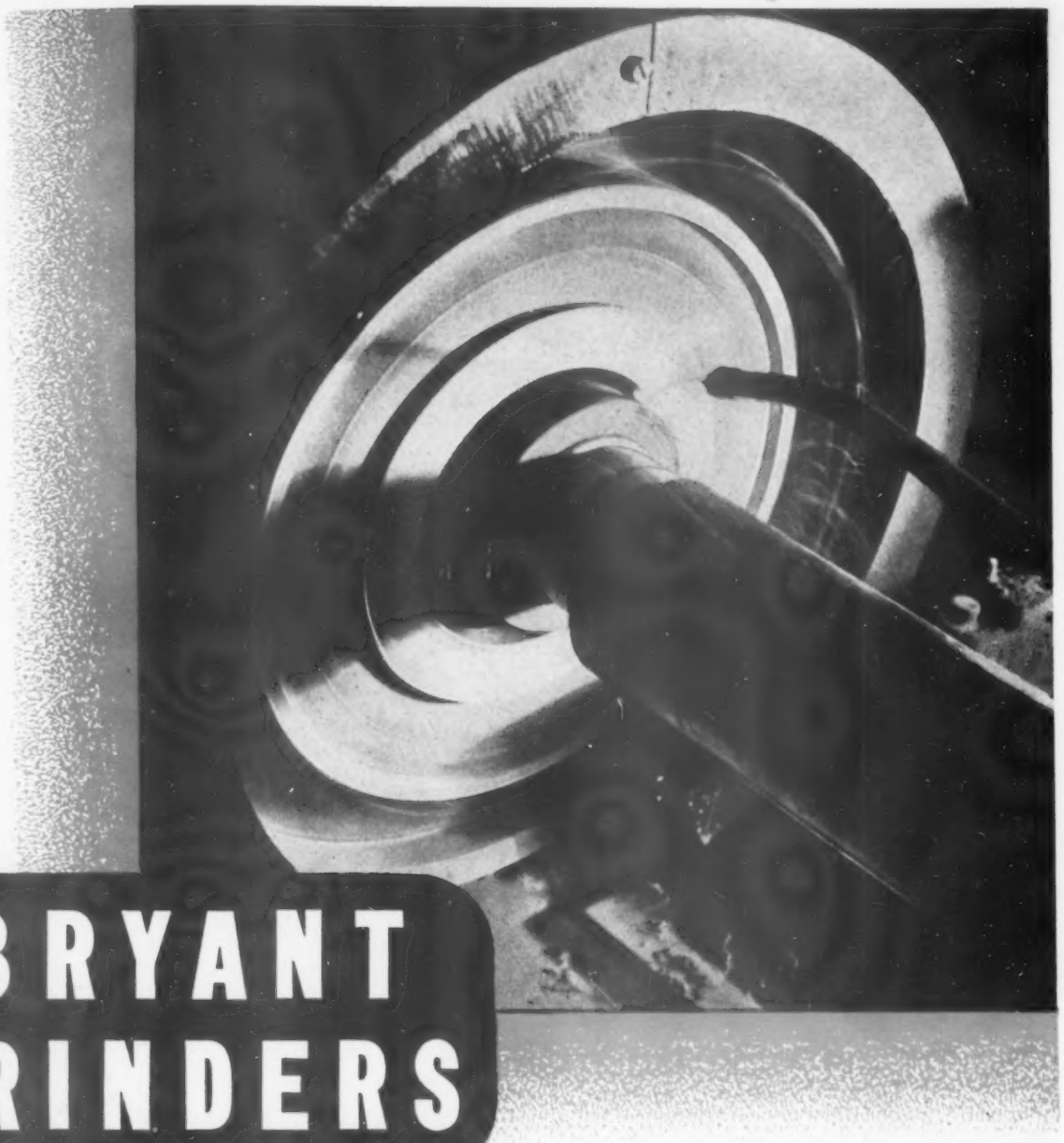
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada



BRYANT GRINDERS

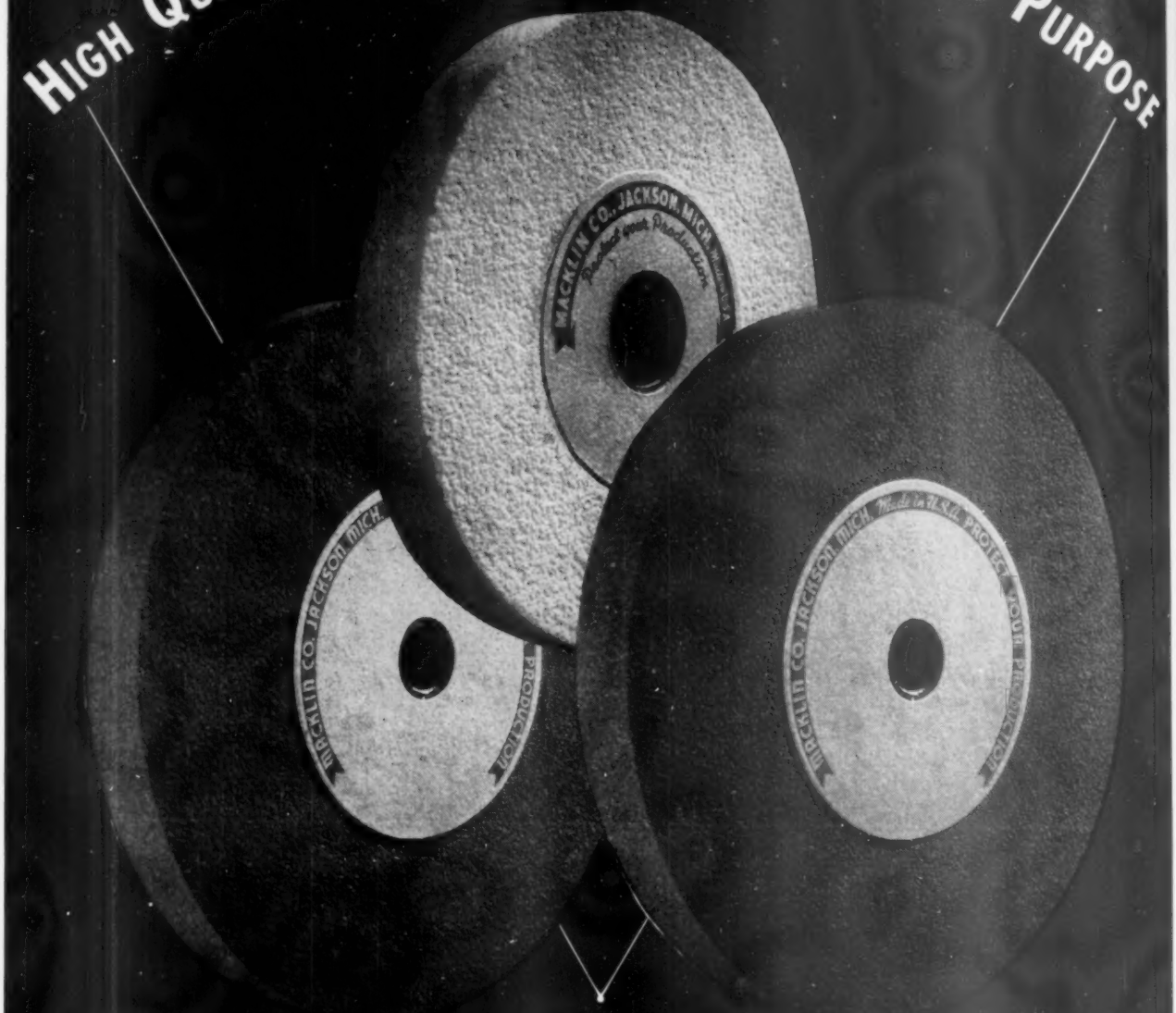
Of all the machine tools in use by industry, none is more basic or more vital than the internal grinding machine.

Machine tool engineers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men in planning today for the peace that must be won after the war is won!

One of these is a Bryant man. Send for him today!

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

HIGH QUALITY WHEELS FOR EVERY GRINDING PURPOSE



"PROTECT YOUR PRODUCTION"

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

MEMO

Complete information about Oster "RAPIDUCTION" Lathes will be furnished promptly but no definite commitments on delivery dates can be made under existing conditions. The Oster dealer in your locality will advise you of the current status of delivery schedules at any time.

A critical shortage of highly skilled operators was faced by a manufacturer with large contracts for aviation valve stems and guides and other contracts for 20 mm. projectiles.

The "manpower shortage" was overcome by installing a battery of Oster "RAPIDUCTION" Lathes whose SIMPLIFIED construction and operation made possible rapid training of women with little or no prior experience as machine operators.

Results were stated by the owner of those Oster "RAPIDUCTION" Lathes to be *"Very Satisfactory."*

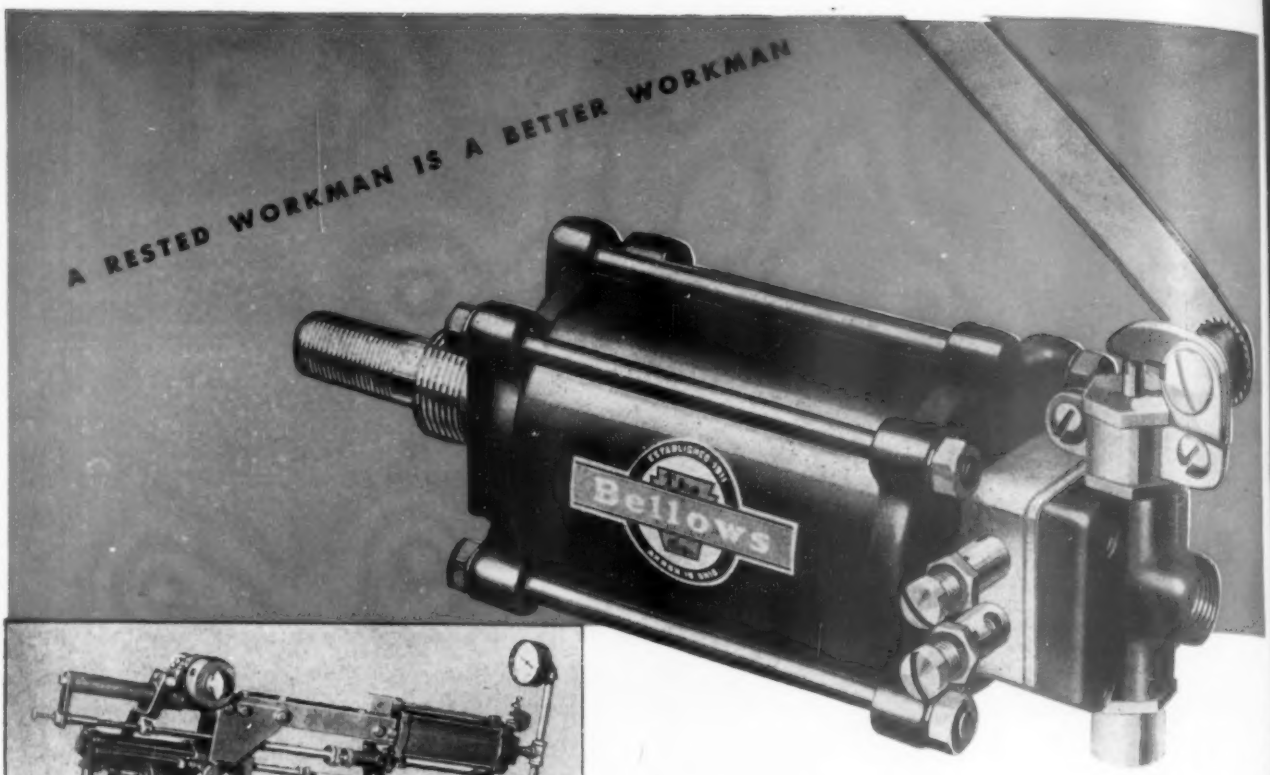
Wartime performance of Oster "RAPIDUCTION" Lathes forecasts a peacetime demand for Oster-engineered equipment designed for fast, accurate machining at low cost.

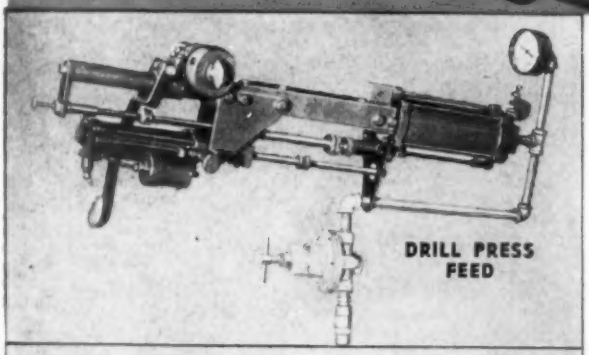
OSTER

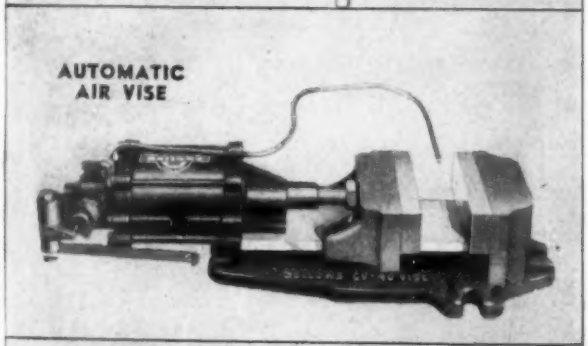
"Rapiduction" LATHES

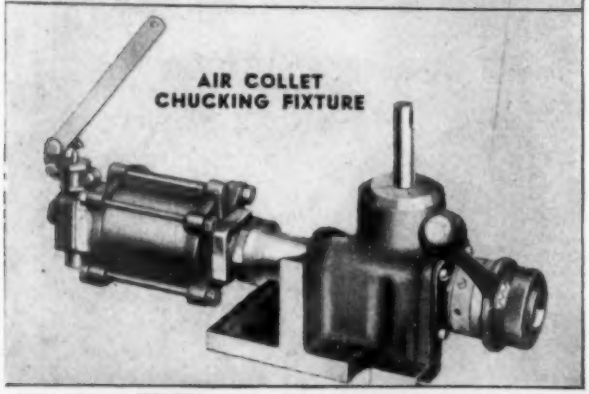
THE OSTER MANUFACTURING COMPANY, 2063 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

A RESTED WORKMAN IS A BETTER WORKMAN









These unique controlled-air devices

REDUCE FATIGUE
SPEED PRODUCTION

make manual operations automatic

BELLOWS Controlled-Air Devices make hand feeding, clamping, holding automatic. In addition to the production increase obtained from the faster action of these accurately controlled air units, the reduction in operator fatigue assures a more uniform rate of production . . . a more uniform quality of production . . . and definitely lessen shop accidents.

So positive are the sensitive, integral controls on Bellows equipment that even inexperienced operators can be quickly trained to produce precision work.

THE AIR MOTOR
Integral valve, speed, and operating controls; easily synchronized to machine cycle. Available in strokes up to 48"; thrust approximately five times air line pressure.

THE DRILL PRESS FEED
Feeds tools to work or work to tools with controlled pressure and speed. Speed of cutting and non-cutting strokes independently controlled.

THE AUTOMATIC AIR VISE
—a ready made jig for holding small parts—(jaw opening 2¼"); clamping pressure from 0 to 500 lbs. Exhaust air stream ejects parts or cleans chips from work area.

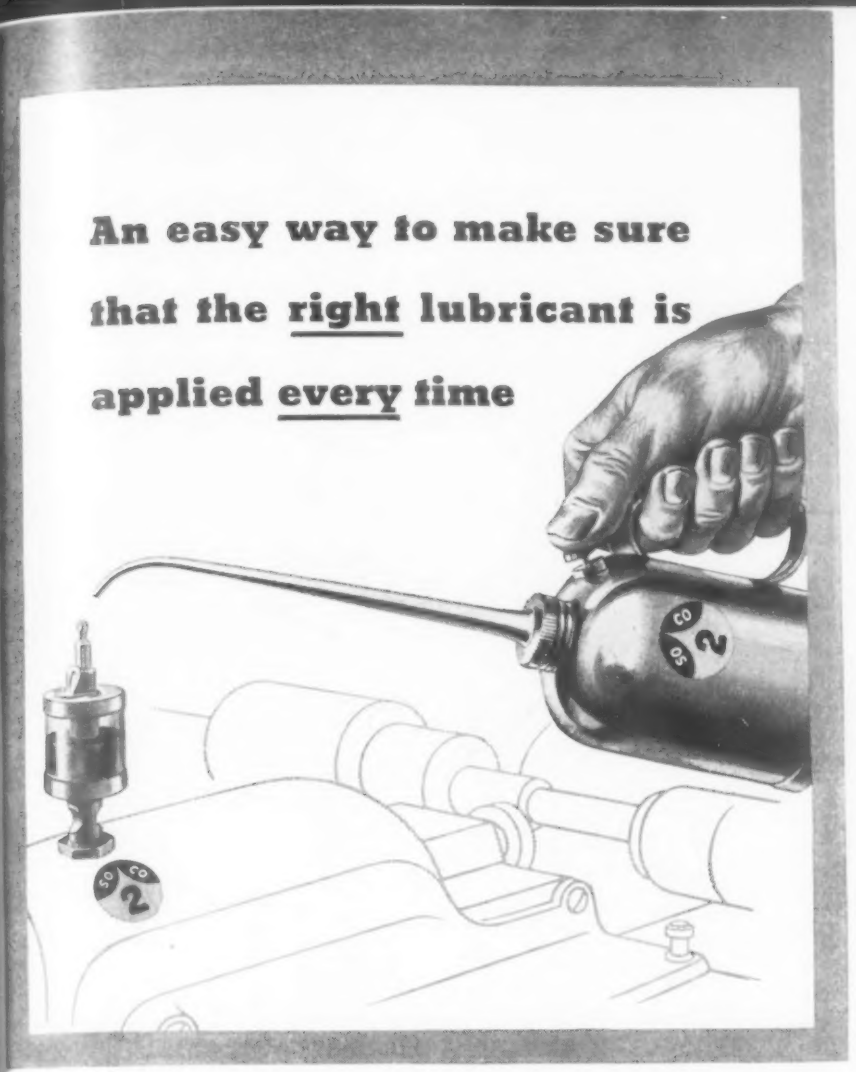
AIR COLLET CHUCK
Jaws furnished blank for drilling to your specifications; handles stock up to 1" if depth is not over ¾" (stock limited to 9/16" if to pass through collet). Air or hand operated.

Write for the Complete Line Folder

The Bellows Co.

ESTABLISHED 1911

Akron 10, Ohio



Standard Coded Lubrication Service

CODED LUBRICATION is one of the most important forward steps to insure better lubrication that has been made in many years.

In spite of past progress in producing better lubricants and the time spent developing better methods of application, one question still remained—was the *right* lubricant used on *every* application *every* time?

Now Standard Coded Lubrication Service answers this question completely. A simple lubricant numbering system makes it practically impossible for a conscientious oiler crew to misapply lubricants.

Standard Coded Lubrication Service is described at the right. Note these advantages over other systems you may have tried.

1. Only two color combinations and simple numbered decals are used to designate various lubricants.

2. The color combinations, red and yellow, and blue and yellow are easy to distinguish in any light.

3. The numerals are easy to recognize and remember even by those who do not know English.

4. Only one simple record is needed, which is made up when the system is installed. There are no complicated forms to fill out or keep up to date.

5. The code numbers used, apply only to the lubricant used in your plant and not to SAE or the maker's brand or grade numbers.

Send for the booklet fully describing Standard Coded Lubrication Service. If your plant is located in the Middle West a Standard Oil Industrial Service Representative will be glad to discuss this system with the men in charge of your lubrication.

Gasoline Powers the Attack . . .
Don't Waste a Drop!

FREE BOOKLET TELLS HOW

this simple code system may be fitted to your lubrication plan:

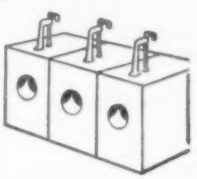
Flexibility and adaptability are outstanding features of this system. Note that it is a *numerical* system not to be confused with complex "color scheme" systems. Here are the few simple steps in this plan. A code number is assigned to each lubricant in your plant. Numbered decalcomania transfers are furnished by us in quantities sufficient to be applied to:

—every point of lubrication on every machine

—every grease gun or oil can used in servicing equipment

—every container or drum on your lubrication cart where they are used

and every barrel, drum, or storage tank in your oil house.

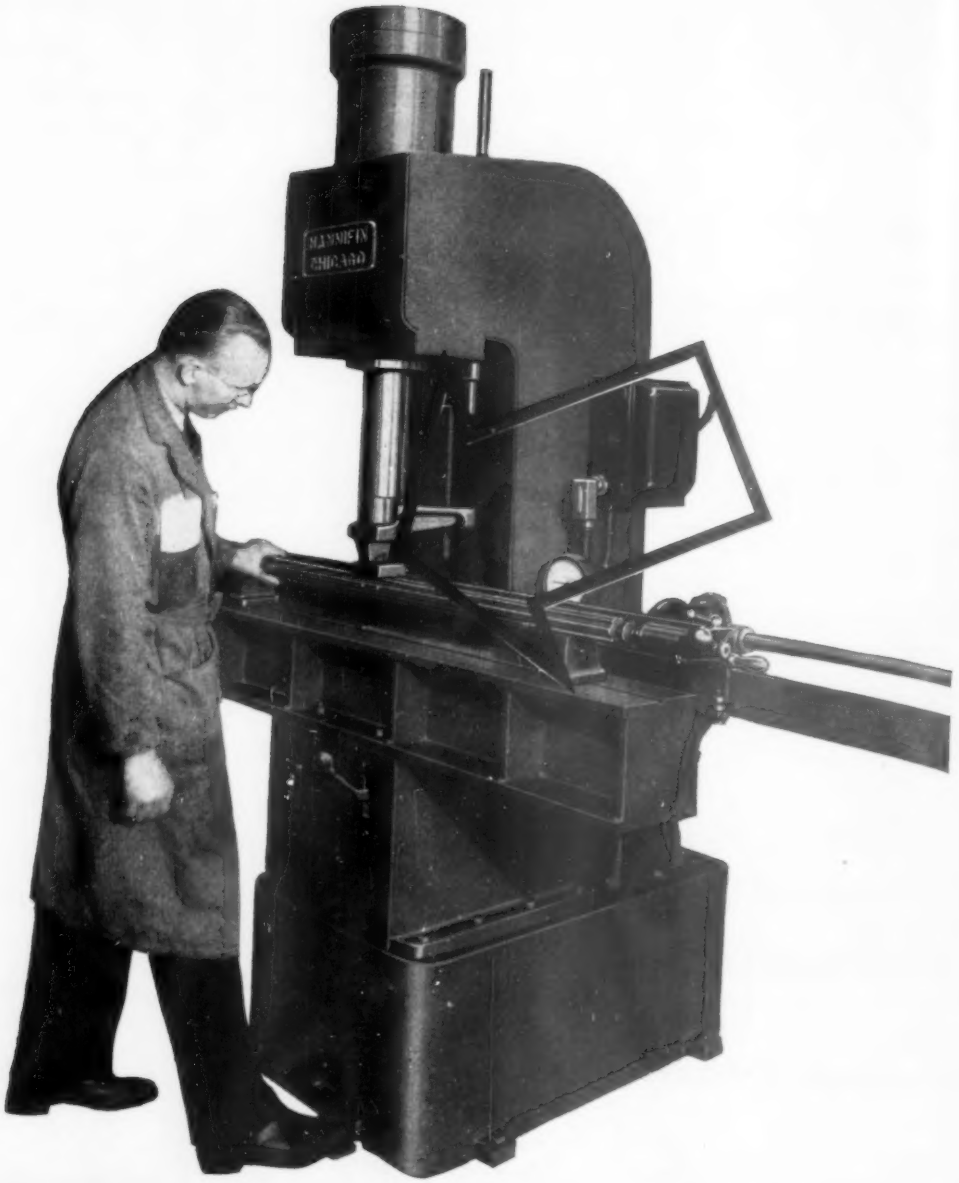


Machine Record Cards: Where desired, a supply of machine record cards (4" x 6") is provided.

Lubrication Chart: For control purposes, a card is provided to list, by brand name and code numbers, all lubricants used in the plant. This card is used by stock clerk or stockkeeper to enable him to requisition products by brand name, and to mark barrels with the correct code numbered decal.

This Booklet gives full details of how Standard Coded Lubrication Service can go to work in your plant. Ask your Standard Oil Man for a copy. Talk it over with him and the men in charge of your lubrication. See how this plan fills a gap in your lubrication program. Call the nearest Standard Oil Company (Indiana) office, or write 910 S. Michigan Avenue, Chicago 80, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE



A delicate touch...for a delicate job

H Hannifin

HYDRAULIC PRESSES

PRODUCTION PERSPECTIVES

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

WAR PRODUCTION: Though overall output tumbled during the summer, fourth quarter requirements of the metal-working industry are the highest since Pearl Harbor. Production schedules have been revised upward again at least 2 per cent per month for the early fall months....An estimated 48 per cent of the total 1944 war production program was completed in the first 6 months. Only an early Hitler collapse will prevent a crisis in certain categories.

CRITICAL MONTH: October is calculated as the peak month in the war production program. Deliveries required have been set 21.5 per cent greater than the 1943 monthly average, 24.6 per cent above those of June this year....Armed Forces resistance to reconversion plans talk results in part from the poor showing of war industries this summer. June output fell 1 per cent below May's, fully 3 per cent behind schedule....Scattered July reports look no better.

BREAKDOWN: Every major category of war materiel except combat vehicles is currently short of requirements....Artillery and heavy shells have replaced aircraft in the Number One priority spot, with foundries and heavy tire plants showing up as the worst bottlenecks....Artillery requirements have risen 500 per cent....Heavy aircraft cutbacks made last month, releasing 100,000 workers by December, presage concentration on super-bombers.

MANPOWER: Currently critical in spots, the overall manpower picture is expected to change dramatically by winter. Predictions of early unemployment now are common....A few heavy industries including steel mills, foundries, tire and machine tool plants are in immediate need of 250,000 workers....Unpublicized Government surveys indicate declining production and continued manpower shortages can be attributed to labor waste and low worker output. New wage incentive programs are boosting output more than 40 per cent.

WOMEN IN INDUSTRY: By mid-summer, U.S. utilization of womanpower reached its peak with 18,590,000 employed, as compared with 11,000,000 before the war.... Employment of "Greenies" in manufacturing rose to an all-time high of 4,332,000 last January, has since declined steadily. Of the nation's total manufacturing working force last month, 32 per cent were women.

NO PROBLEM: The much debated subject of what will become of "women in industry" appears to be solving itself. Up to 90 per cent of the "spot" layoffs in war industry are women workers. Of all women layed off, as many as 9 out of 10 are failing to look for new jobs, are returning to homes or civilian pursuits.

THE ROAD BACK: Good signposts along the road to reconversion are changing industrial labor requirements....Donald Nelson's demand before a Senate Committee for an OK on his reconversion plans included the pridiction that the labor force necessary to turn out munitions will be 1,000,000 less next December than in the same month in 1942....Sharp reductions in Armed Forces requirements – now down to 100,000 monthly – has resulted in abandonment of war industry Manning Tables and Replacement Schedules for Selective Service.

MACHINE TOOLS: Despite the industry's best efforts productionwise, June shipments totaled only $41,331,000, down $488,000 from the preceding month. Lack of skilled manpower is the trouble....Decreased military requirements resulted in a 25 per cent drop in order writing....Unrated postwar orders are beginning to come in, now appear certain to provide the industry with a comfortable reconversion cushion.

DPC SURPLUSES: The job of unloading more than 100,000 Government-owned machine tools is now under way. Announcement of the Surplus Pricing Schedule is expected to start a flood of buying, with in-plant purchases most numerous. ...The Bramson PRODUCTION Poll of the Metal-Working Industry (see page 106) shows more than 68 per cent interested in buying DPC machine tools.

Official U. S. Navy Photo

A SCREW THREAD "TASK FORCE" THAT HELPS YOU WIN PRODUCTION BATTLES!

We hear a lot about *teamwork* in this war . . . amphibious and triphibious operations . . . the coordination of land and air and sea forces.

There are similar "task forces" of men and machines and tools in industry, too. Threading metal parts, for example, must be done at high speeds and at accuracies measured in ten-thousandths of an inch or even finer. This has meant the development of a "team" of high speed precision taps and dies to cut the threads . . . plus gages to check the accuracy.

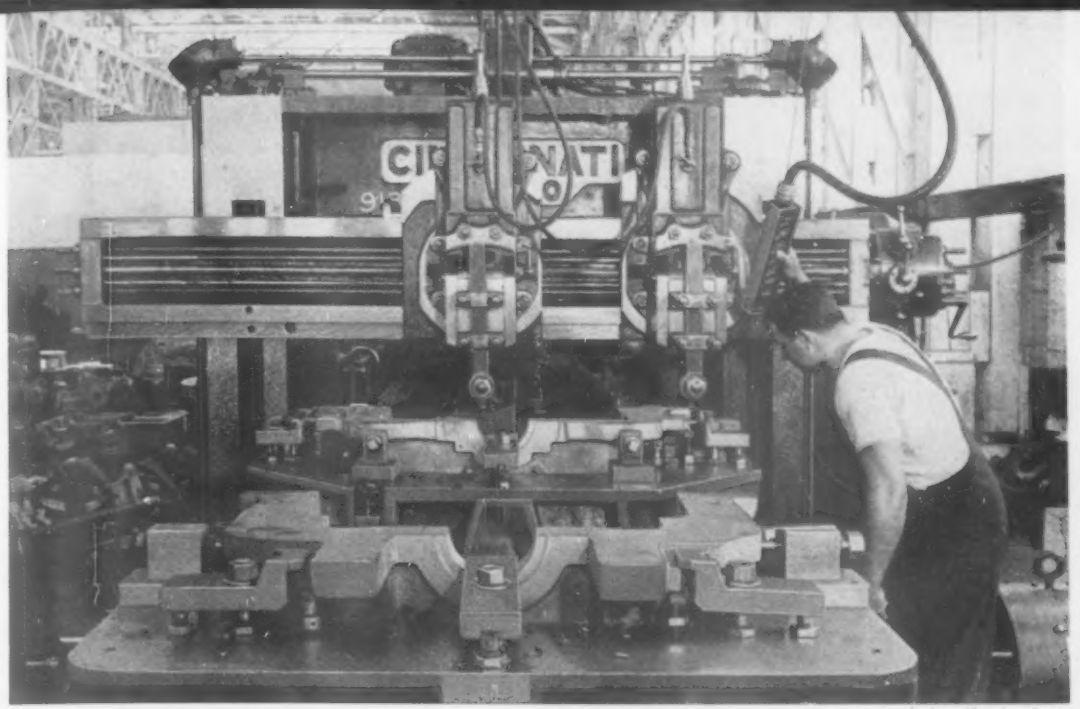
"Greenfield" has devoted itself to the perfecting of this screw thread "task force". It has a country-wide staff of field engineers . . . its "intelligence" . . . continually bringing in reports of operations. It has its "headquarters staff" of trained screw thread and gage engineers to turn these field reports into blue-prints and plans . . . and it has a highly skilled "army" of men and women with the equipment to turn blue-prints into tools . . . the "Greenfield" Taps, Dies, and Gages that together form screw thread "task forces" in the plants of America's metal-working industry.

ARMY E NAVY

GTD GTD GREENFIELD

Better Threading with Better Tools

GREENFIELD TAP & DIE CORPORATION
GREENFIELD, MASSACHUSETTS, U. S. A.



Joshua Hendy photos

Readily loaded fixtures and machine setup for facing matched halves of standard-set turbine cases.

MASS PRODUCTION IN HEAVY INDUSTRY

JEROME WILFORD
ASSOCIATE EDITOR

TOOLING for high output of Liberty engines and turbines has made the Joshua Hendy Iron Works of Sunnyvale, California, a number one factor in the job of carrying the war to the enemy. Though much of the expansion has been one of adding buildings and manpower to the job, an extensive outlay of talent and skill was required to organize the production system, and to design tools which would engage the space and manpower to fullest capacity.

Aggressive production management has capably selected machines to do the jobs. Ingenious development of fixtures has made the most economical use of these machines, insuring full operating time, maximum output of parts up to specifications.

PRODUCTION FROM PLANERS

Such "bottleneck" machines as planers are operated to full capacity through the design of work-holding fixtures which permit rapid and accurate setup of such tough-to-handle parts as the semi-spherical cast bodies which constitute the upper and lower halves of turbine casings.

In rough machining on the planer, a holding fixture serves as a jig to align the part. A layout line, developed in relation to the flange which must be planed to specified thickness, serves to align the part with the upper surface of the jig which serves as a surface plate. Of four jacks, three are adjustable to equalize the part, the fourth serving for support to prevent the part from rocking under machining pressure. Both upper and lower halves are planed, side by side, the tool taking 1/16″ cuts, and indexing ⅛″ for each stroke.

Following planing, the work is moved to open-side milling machines where holes are drilled in lugs to permit assembly of the halves. Mating surfaces are also lapped in a roughing operation to permit accurate drilling in assembled position. The parts are annealed for stress relief, with ¼″ of stock left all over.

Holes are drilled with relation to outer walls from locations obtained by layout which determines the amount of stock which will be removed in other machining operations. Stock on the back of the flanges must check properly. Holes are located on the upper half only, holes on the lower half being located from these, following temporary assembly.

In the King 72″ vertical boring mill, one-half of the case is mounted in a quick-location fixture with relation to the drilled holes to permit facing, machining the I. D., and countersinking surfaces which are recessed in relation to the second half as assembled. The second half is then mounted, with mating surfaces flush against those of the previously mounted piece. Then the rough boring is performed on the vertical internal diameter, the flange and tongues.

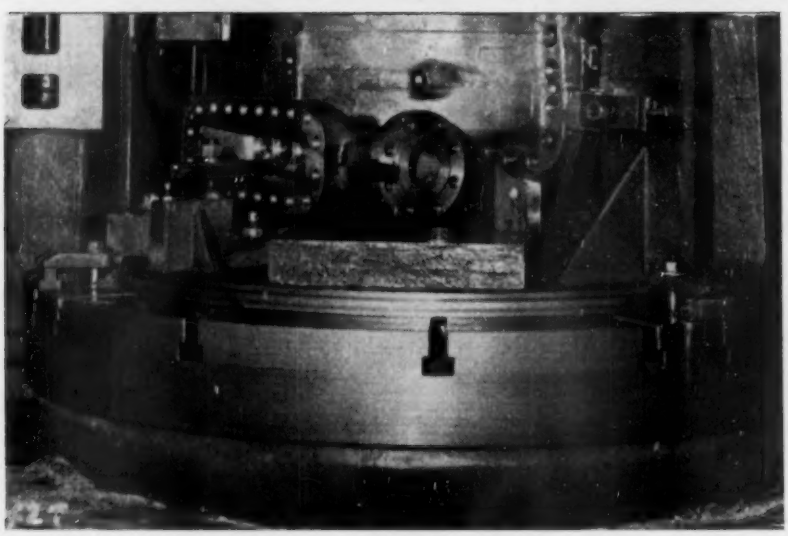
Back on the planer, the mating surfaces are finish machined, the parts are finish drilled in a radial drill, and the boring operation is repeated, with larger dowels accurately locating the

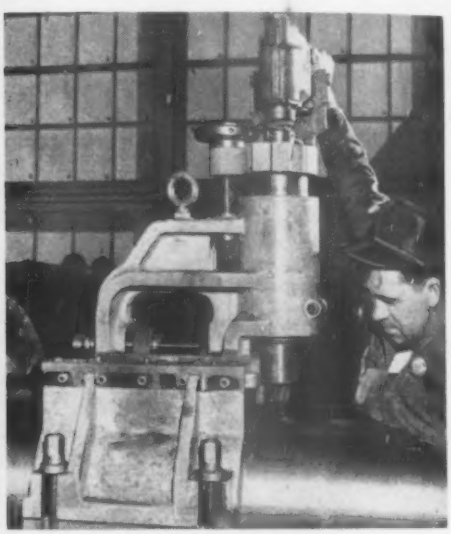
Joshua Hendy, a West Coast manufacturing leader, tooled for high output of heavy parts from standard machine tools. Materials handling was aided by portable tools taken to the work

Grooving inner surface of turbine casing on King mill. Note absence of channeled flange on one half of bore. This necessitates turning I.D. of half case prior to assembly of matched half for grooving and turning. Fixtures permit fast setup, accurate work location.

sign and application of a coil winder for inner-pole coils on generators, and the portable machines which are applied to fabrication of such large parts as ship tail shafts and marine engine castings.

The coil winder, handling copper strip 1″ wide and .170″ thick, consists of a rotating table which descends in synchronization with the turns of the coil on a screw jack. A tapered matrix, incorporating a heavy column to establish the I. D. of the coil,





Above, left: **Fixture for setup on King boring mill.** ***Above, right:*** **Hendy portable key-seat milling fixture.**

halves with respect to each other.

For internal grooving of assembled turbine sets, a head with indexing tool holders permits roughing, semi-finishing and finishing operations without changing head or bar. Turrets on the end of the bar are advanced by hand through a port in the case. This not only saves tool setups, but permits finer accuracy in a job which is located entirely by gaging the advance of the bar from a machined surface. Following grooving to depth, through the use of the turret, the bar is backed over to face the groove with relation to the exterior surface of the turbine set, as indicated by a mark on the boring bar.

In boring a 23″ diameter ledge, a double-edge tool, with a lip in the center is used.

To machine a tapered bore from a cylindrical surface, a Hendy production engineer devised a "porcupine" tool, which consists of a tool holder in the form of a truncated cone, with two series of tools spiralling in diametrically opposite paths. Sixteen tools, eight to each side, are advanced into the work, with the first taking the heaviest cut—forming a triangular-shaped chip section. Tools advance at the rate of .011″ per revolution. A 15 hp motor is required to drive the tool holder. A simple clean-up operation is performed with a tapered spiral reamer.

COIL WINDING METHOD

Two of the most advanced types of development in Hendy production engineering are represented by the de-

over which plate sections are mounted to separate each flat turn of the coil and which establish the O. D. of the coil, is mounted on the table. Pressure of a shoe, in the form of a double roller, against the matrix, forms the coil as the strip is fed from a roll through a tension holder.

Though the tension and the slots between the plates of the matrix prevent the strip from wrinkling, the effect of the stretching and bending operation is to slightly work-harden the coil. An annealing operation followed by hand straightening around a form is therefore required. When the entire operation was done by hand, about four coils were produced in one day. Regular output now averages 24 coils per day.

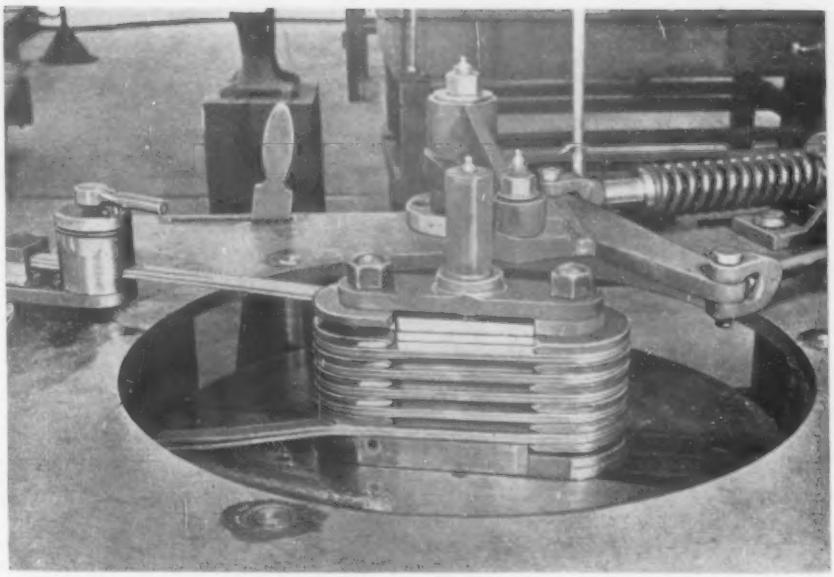
The shoe is held against the matrix

by pneumatic pressure, against an equalizer spring. The spring equalizes pressure in the back-and-forth movement of the shoe and piston as they ride over the oval shape of the matrix. The strip is locked in the lower slot of the matrix by a small cam which turns within a recess in the lower face of the slot. The matrix is built in sections, a requirement in removing the finished coil, and with the acceptance of the starting end of the strip, the layers are tightened down by a bolt and nut on top of the matrix, so that in respect to the strip as installed, each layer is adjusted to proper width.

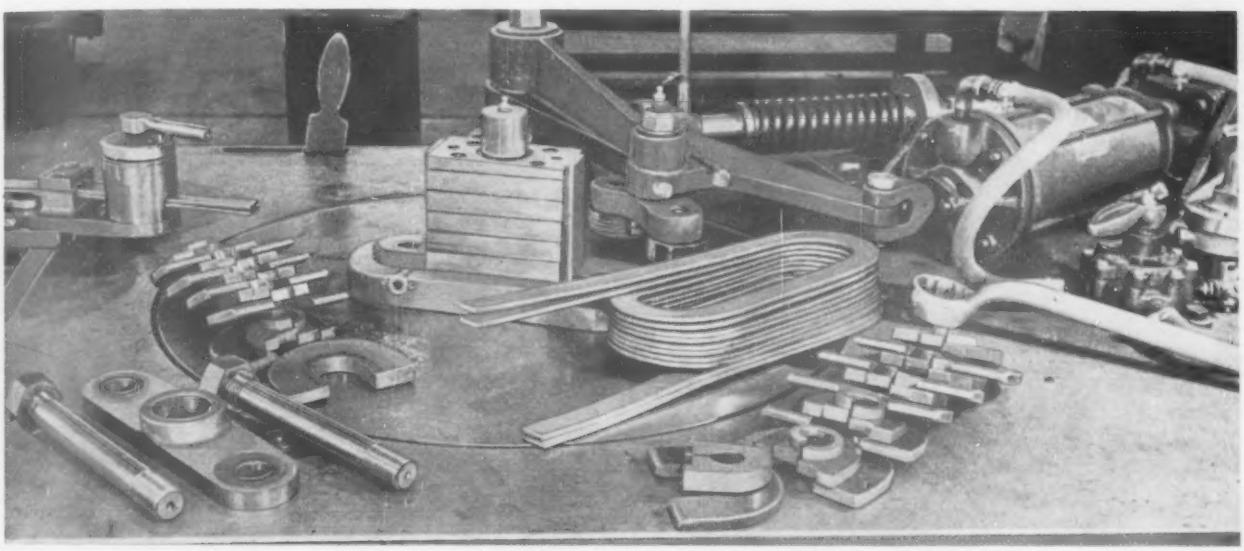
With each complete revolution of the coil, the table descends an amount equal to the distance between turns on the matrix, so that the coil is fed in a direct line from the tension holder at the side of the fixture. A radius of as small as 1-5/8" can be developed on the winder.

Among the portable tools which Hendy production engineers have developed, two outstanding examples are the portable line reamer and the portable keyseater. The keyseater clamps around a shaft, or to whatever work it is required to machine, and a worm feed moves the head against, and with relation to, the back of the clamping fixture. As used at present, the head is driven by an Ingersoll-Rand air motor. In roughing operations, a 2-flute end mill is used, and in finishing operations, a conventional multi-flute spiral mill is applied. Depth of cut is controlled by manually operated feed mechanism.

THE END



Coil on the last turn of the coil winder.



***Above:* Completed coil section, with disassembled matrix on table of coil winding machine. *Below:* Generator coil winder in operation, with coil half turned.**

Machining Magnesium

Recommended Practice for Better Results and Fire Prevention

A. M. LENNIE
MAGNESIUM DIVISION
THE DOW CHEMICAL COMPANY

DESPITE THE FACT that magnesium has been proved one of the easiest of all metals to machine, proper design and use of tools can do much in obtaining full benefit of the metal's potentially low fabricating costs.

Because of the high combustibility of magnesium in certain forms, improper use of tools, methods of cutting and handling the metal greatly increase the possibility of spontaneous fire. Careful adherence to shop-proved methods of operation will reduce this danger to a negligible factor.

APPROVED MACHINING METHODS

● SAWING: Magnesium is very readily cut with band or circular saw as well as with hand or power hack saws. Due to the low cutting pressures larger cuts can be taken per tooth than are possible with other metals. This fact necessitates larger chip spaces to permit the saws to remain free-cutting. Too small a tooth pitch or chip space will cause the saw to ride over the work and rapidly dull the teeth.

Recommended tooth spacing for various types of saws is indicated in Table A. The set of the teeth must be relatively large, and relief angles on circular saws must be adequate to minimize friction. Recommended values for tooth set and relief angles are also indicated in the same Table.

Special teeth profiles developed to give better cutting action to circular saws work very well.

The best quality saws should be used to obtain good service life. Whenever possible high-speed steel should be used with the exception of circular saws where carbide tips will give superior saw life.

Sawing feeds are best determined by the requirements of the particular job and the type of sawing machine being used. A rough estimate of the allowable feeds may be made, based on the fact that magnesium requires only 1/10 the power that is required for sawing steel. Feeds up to 120" per minute can be used when sawing magnesium with circular saws.

● AUTOMATIC SCREW MACHINE WORK: Magnesium is a very good screw machine stock. It may be machined at higher speeds and feeds than any of the other metals used for this purpose.

Usually maximum cutting speeds available on machines may be used. While excellent machining characteristics permit the use of feeds which average about 50 to 75 per cent higher than those used in machining brass, the feeds are limited by condition of the machine tool, surface finish desired, and size of the work piece. Heavy feeds are preferred for magnesium alloys because they produce well-broken chips.

Feeds as low as approximately .015" will produce short coils; below this limit the chips are apt to consist of long coils or ribbons. These long coils break up very easily, however, and do not obstruct the cutting tool or work. The use of magnesium alloys lessens tool wear, which means long tool life and less down time.

All available extruded magnesium alloys are suitable screw machine stock. The low power consumption, high feeds and speeds, good chip formation, and excellent surface finish as well as good control of stock size all combine to produce economical screw machine operations, and often make it possible to reduce cost.

The light weight of this metal is particularly advantageous at high spindle speeds; its low inertia means less wear on spindles, belts, and motors, especially where quick changes of speed are involved.

CUTTING FLUID REQUIREMENTS

● COOLANTS AND TOOLS: Due to the close tolerances required in screw machine work and the necessity of maintaining such tolerances over a considerable period of time, the use of a cutting fluid is recommended on certain jobs regardless of the cutting speeds used. The primary purpose of the cutting fluid on screw machines is to control thermal expansion.

On simple work at low cutting speeds, it may be possible to eliminate the cutting fluid, since only small quantities of heat will be generated; but on the majority of jobs, the use of a cutting fluid is recommended. Tools should not be allowed to rub on the work inasmuch as this will greatly increase the amount of heat generated.

High-speed steel tools will work satisfactorily but the more abrasion-resistant carbide tools will give much longer life. The higher initial cost of the carbide will usually be more than offset by the savings effected through less down time due to fewer tool resettings. Screw-machine cutting tools must be kept sharp with smooth cutting surfaces and ample relief angles.

Screw machine tools require little change from standard tools such as

TABLE A. Recommended saws and saw elements.

SAW ELEMENT	TYPE OF SAW				
	CIRCULAR SAW		BAND SAW	POWER HACKSAW	HAND HACKSAW
	SET TEETH	BEVELED TEETH			
TEETH per inch	1/2-2	1/2-2	4-6	2-6	12-18
TOOTH SET inches	0.02-0.05	0.02-0.05	0.02-0.05	0.015-0.03	
END RELIEF	10-12°	10-12°	10-12°		
SIDE RELIEF	4-6°	4-6°			
CLEARANCE	20-30°	20-30°	20-30°	20-30°	20-30°

PART THREE: One of the easiest metals to machine, magnesium improperly handled can be dangerous. Here is shop-proved practice for important machining operations, with recommended methods for fire precaution

would be used for brass. Special attention must be paid to relief and clearance angles and chip spaces, but in general special tools are not necessary. Important tool features:

● Box Tools: No special features are necessary on this type tool. Chip breakers are not required, the feeds merely being set higher to produce shorter chips. A typical box tool recommended for use on magnesium is shown in Figure 1.

● Form Tools: Rake angles from 0 to 10° are satisfactory with the 0° rake giving better chip breakage. Wherever possible relief angles should have a minimum value of 8°. This fact should be kept in mind by the tool designer when designing form tools for use on magnesium.

It may be desirable to use a side relief of approximately 1° to minimize rubbing of the tool on the work. Ratio of maximum width of cut to diameter of work is approximately 2 for magnesium. Figure 2 illustrates a typical form tool recommended for use on magnesium.

● Drills: Standard drills can be used for drilling shallow holes, but high speed production of deep holes requires special drills, which were described in the August, 1944, Tool Engineer.

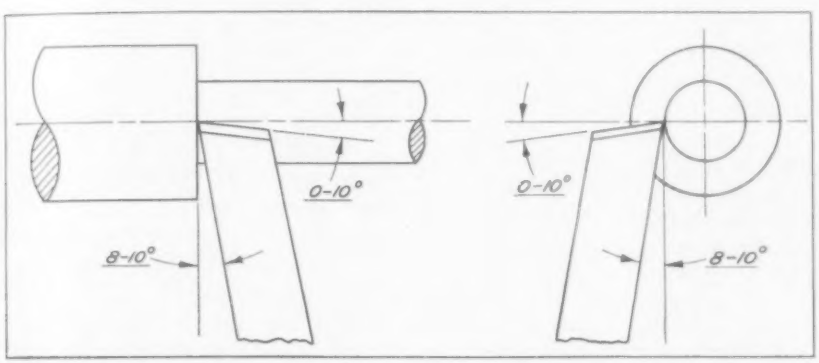
● Taps and Dies: Taps, solid dies, and thread chasers for use on automatic screw machines should be similar to those described in the section on tapping and threading.

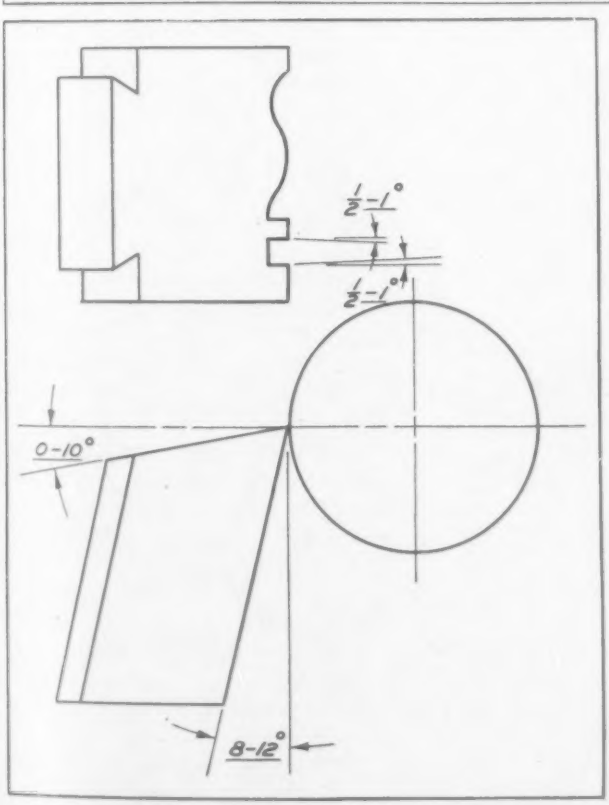
Only slight modifications of standard screw machine threading tools are necessary when used on magnesium alloys as shown in Figure 3.

● Filing: Rotary files or burrs provide excellent tools for casting clean up and filing of irregular surfaces. Best results are obtained from high speed steel burrs which are coarse cut with few cutting edges and deep flutes for good chip clearances.

Surface hardening treatments or chrome plating will give increased abrasion resistance and are recommended for longer tool life. These tools should operate at between 4500 and 7000 rpm, depending upon the burr size.

Single and double cut files of the coarse,bastard, and second cut types work satisfactorily on magnesium. Smooth cut files load up readily but can produce fine finishes if light cutting pressures are used. Single cut coarse files with from 5 to 10 teeth per inch and back rake angles of ap-

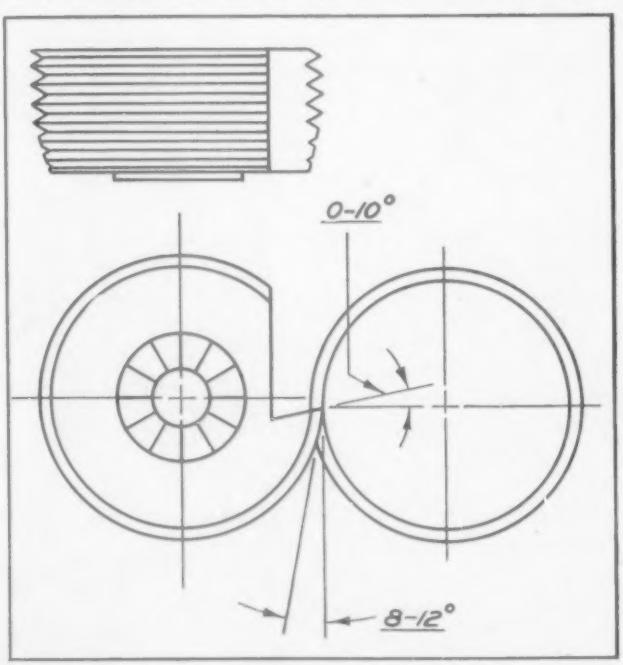




Left, above: **FIGURE 1. Automatic screw machine box tool.**

Left: **FIGURE 2. Automatic screw machine form tool.**

Below: **FIGURE 3. Automatic screw machine thread chaser.**



proximately 10° are recommended for heavy work where an appreciable amount of metal must be removed.

● GRINDING: The finish grinding of magnesium alloys is usually unnecessary inasmuch as finishing cuts will give extremely accurate and smooth surfaces. Rough grinding, however, is widely used in foundry clean-up and for removing flash from die castings and forgings.

The relative softness of magnesium requires use of a medium-to-coarse grained, medium-hard grinding wheel. A grain size of 20 to 40 is used for rough grinding. Coarsest grain possible should be used to avoid loading of the wheels and provide rapid free cutting. An open structure in the range of 4 to 8 should be used to reduce loading.

Silicon carbide or aluminum oxide wheels with vitrified or resinoid bonds can be used. These recommendations are intended only as a general guide, and before setting up a production job the grinding wheel manufacturer should be consulted.

Magnesium grindings and dust are very inflammable; consequently, precautions must be taken to insure that the proper dust collection equipment, as described under Dust Collection, is used.

Magnesium ordinarily should be ground dry to facilitate dust collection, but in special cases, such as finish grinding, where a fine surface finish is desired, it may be satisfactorily ground, using a low viscosity mineral oil as the cutting fluid. Oil should be used generously to insure complete quenching of the dust and effect complete removal to a sludge collecting bin.

At all times the dust sludge should be wet with oil to reduce fire hazard. Machines should be cleaned out frequently to prevent large accumulations of magnesium dust.

● POLISHING: Polished surfaces of any desired quality are very easily produced on magnesium. Surface irregularities are readily removed by polishing operations, and high luster surfaces or articles to be plated or used for decorative purposes can be produced by appropriate buffing.

Table B lists recommended procedures for polishing and buffing.

● DUST COLLECTION AND FIRE PRECAUTIONS: Grinding and polishing of magnesium produces highly inflammable dust which, in proper proportions with air, can ignite with explosive violence.

It is essential, therefore, that this dust be immediately removed from the working area to prevent the formation of explosive mixtures. This can de done effectively with a dust collecting system of the proper design.

A system considered safe for the collection of magnesium grinding and polishing dust is one in which the dust is precipitated by a heavy spray of water or low viscosity mineral oil to form a sludge with a great excess of fluid. The equipment should be designed to prevent the accumulation of dust or sludge in any location where it could dry out to an inflammable composition. Periodic inspections should be made of the collecting systems to insure against such conditions.

The best collectors for grinding stands are small units which serve one to two stands and have the power supply for the grinder, water circulation, and air blower interconnected so that the grinders cannot operate without having the collector in operation.

The grinders should be connected to the collector by short, straight ducts. Figure 4 illustrates the recommended type of dust collector for grinding stands. A central system that serves a large number of grinding hoods or stands can be operated safely if the dust is precipitated by heavy sprays at each booth or stand. The dust should be conveyed by a flowing stream of water or oil to a central settling tank.

DISPOSAL OF SLUDGE

Such a system will be safe if dust or sludge does not accumulate in the ducts. The power for the grinders, air blowers, and liquid circulation should be interconnected, as in the smaller unit systems.

Sludge pits should be adequately ventilated to prevent the accumulation of hydrogen gas. The sludge which collects under the liquid in the pit should be removed frequently and disposed of by mixing with five parts of sand and burying or by spreading in thin layers on non-combustible surfaces and burning after it has dried.

The same principle of dust collection can be applied to grinding and polishing booths where the work is done on a grating as shown in Figure 5. The flow of air in the hood is past the work, through the grating and through a liquid spray which removes the dust. The hoods or booths should be designed to catch as much of the dust as possible, keeping it off the floor and workmen's clothes.

A hood around individual grinding wheels arranged so that dust particles can impinge on a pool of oil in a pan below the hood will work satisfactorily for small scale or intermittent work on magnesium.

This arrangement is shown in Figure 6. The dust particles sink rapid-

TABLE B. Typical procedures for polishing when surfaces are to be plated or used for decorative purposes.

OP. NO.	OPERATION	ABRASIVE	TYPE WHEEL	WHEEL DIA. *Inches*	WHEEL SPEED *fpm*	REMARKS
1.	ROUGH POLISH	60 TO 100	CANVAS, SHEEPSKIN OR FELT	6 TO 12	3000 TO 5000	REQUIRED ONLY FOR ROUGH SURFACES SUCH AS SAND CASTINGS. GREASE STICK MAY BE USED.
2.	MEDIUM POLISH	100 TO 200	BUILT UP CLOTH	6 TO 12	4000 TO 6000	GREASE STICK MAY BE USED
3.	DRY FINE POLISH	DRY COMPOUND	LOOSELY SEWED BUFF	6 TO 12	3500 TO 5000	
4.	BUFFING	TRIPOLI	LOOSELY SEWED BUFF 74 TO 82 COUNT CLOTH	10 TO 14	6000 TO 8000	
5.	COLORING	DRY LIME	CANTON FLANNEL BUFF	12 TO 16	8000 TO 12000	MINIMUM PRESSURE TO PRODUCE BEST LUSTER

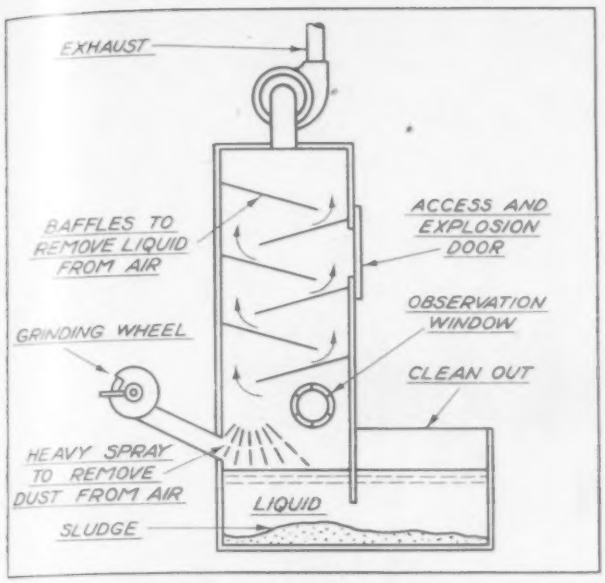


FIGURE 4. Dust collector for use with grinding wheel stands.

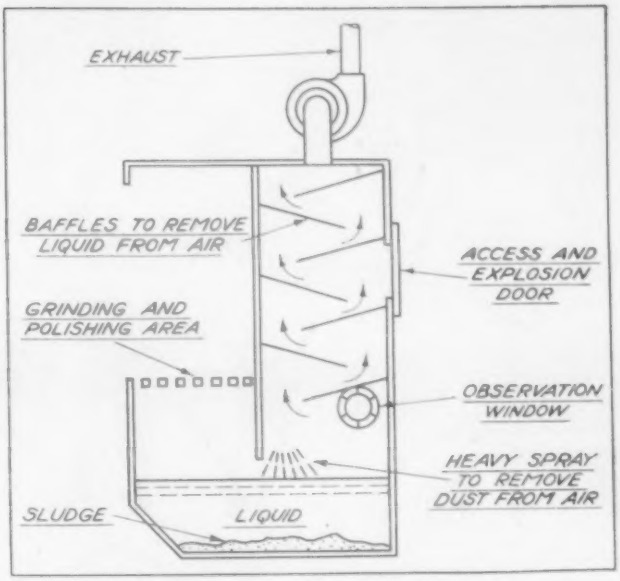


FIGURE 5. Dust collector for grinding and polishing booths.

Dow Chemical drawings

ly below the surface of the oil, forming a non-hazardous sludge. Due to the lack of suction, a small portion of the dust will escape from the hood. This dust must not be allowed to accumulate, but should be swept up periodically and disposed of under oil.

Central collecting systems in which the dust is passed through long, dry or partly dry ducts and the conventional dry type filter collectors are dangerous and definitely not recommended for the collection of magnesium dust. Accident records for systems of these types have proved them to be very hazardous.

● FIRE PRECAUTIONS: The following important precautions in addition to those already mentioned must be observed:

1. Mark grinding equipment "FOR MAGNESIUM ONLY". Grinding of other metals on equipment being used for magnesium is dangerous because of the possibility of producing sparks.
2. The grinding of magnesium surfaces which have been Chrome-Pickled will cause sparks. Special precautions should be taken to insure against accumulations of dust or explosive air-dust concentrations within range of sparks.
3. Operators of grinding equipment must avoid coarse textured or fuzzy clothing. Leather or smooth, fire retardant clothing should be worn and brushed frequently. Clear lanes to conveniently located fire showers should be provided.
4. The accumulation of magnesium dust on benches, floors, window ledges, overhead beams, pipes, and the like should be avoided. Good housekeeping is essential in the safe grinding of magnesium.

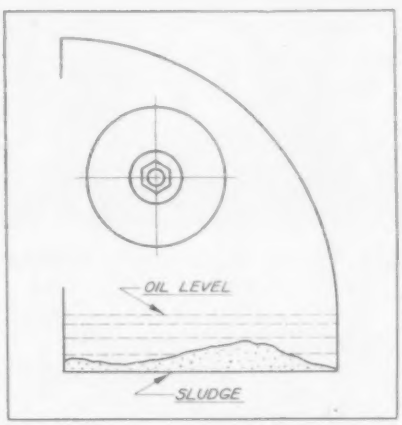


FIGURE 6.
Dust collector for small wheels used intermittently.

Vacuum cleaners should not be used to collect the dust. It should be swept up and placed in covered, plainly labeled iron containers and should not be mixed with regular floor sweepings. Dust should be disposed of by burning in small quantities on a metal surface or by burying after mixing with five parts of sand.

5. Adequate warning signs should be prominently displayed inside and outside of grinding rooms. Signs should warn about the use of water on fires and should recommend the use of a satisfactory extinquisher.
6. An adequate supply of extinquishing compound in plainly labeled, covered iron containers should be kept instantly available near each grinding unit.

● KNURLING: Magnesium alloys work-harden very rapidly. This property restricts the use of any operation such as knurling, which involves the cold working of the metal.

A slight modification in the design of the knurls to reduce the amount of cold working results in satisfactory knurled surfaces. Knurling tools should be kept sharp and the impressions must be shallower than those used for steel or brass. Single straight toothed, rather than diamond cut knurls are preferred, due to the smaller amount of cold working involved.

● SPECIAL LATHE OPERATIONS: Special "setups" may be used to advantage, due to the low cutting speeds available on small lathes and the inability to rigidly chuck extremely light magnesium alloy parts. Auxiliary motors may be mounted on the carriage and used to drive small rotating tools such as mills, form cutters and threading tools.

Equipment such as this combines the speed of the lathe and the tool to produce high cutting speeds. These high speeds permit rapid cutting with very light feeds. Light parts such as binocular frames and goggle bezels cannot stand heavy cuts, and light cuts at normal speeds would require many passes of the tool; consequently, special lathe setups can be used advantageously.

● HAND TOOLS: The excellent machinability of this metal permits faster and easier operation of hand tools than do most others.

This characteristic permits use of such tools as hand planes and portable milling cutters. Other types of portable hand tools such as drills, burrs, chisels, and chipping tools can be used on magnesium alloys. THE END

Consolidated Vultee photos

Manual riveting assembly is easily utilized in close quarters.

New Riveting Assembly

Rivet-bucking assemblies developed for aircraft production improve workmanship and reduce worker fatigue. Types have been designed for application to automatic and manual riveting operations.

THOMAS A. DICKINSON

CONSOLIDATED VULTEE AIRCRAFT CORPORATION

SAVINGS IN MATERIALS, reduced manpower requirements, increased output, and improved workmanship have resulted from the development of a new-type bucking assembly for production riveting at Consolidated Vultee Aircraft Corporation, San Diego, California.

The assembly may be advantageously utilized in a variety of manual and automatic riveting operations. Essentially, it consists of a "floating" bar, which is positioned against the shank end of the rivet, and two or more spring-actuated reacting hammers, which operate against the back side of the bar in response to impulses from the conventional air-driven riveting gun.

Since the reacting hammers are not connected to the bar, the gun impulses are transmitted through the bar to the hammers. The bar itself always remains positioned against the upset end of the rivet, while vibrations are set up in the reacting hammers to augment and oppose the impulses of the rivet gun. A specially-formed rubber stop, adjacent to each of the reacting hammers, serves to hold the floating bar against the rivet continuously, damping any tendency of the bar to vibrate.

As the accompanying photographs indicate, the assembly is constructed in a considerable number of sizes and shapes. It can be set up in a riveting jig so as to function automatically on substantially all of the rivets in the assembly, thus eliminating manual bucking. In this capacity, the floating portion is in the shape of an elongated steel bar, extending behind each row of rivets, supported at each end to the sides of the fixture or intermediate members by means of a device which serves to guide the bar and support the reacting hammer and rubber dampers.

This device is pivoted to the framework of the jig so that the bar is flex-

ibly held. Thus, it helps in locating the bar against stringers or other reinforcements. The bar does not have to be straight nor horizontal; it may be curved or offset to accommodate the configuration of any line of rivets. Provisions may be made on the bar to accommodate rivets of different sizes or group of rivets that are adjacent to the main line of rivets. A gauge on each supporting device controls the size of the upset head, promoting uniformity and preventing over-riveting.

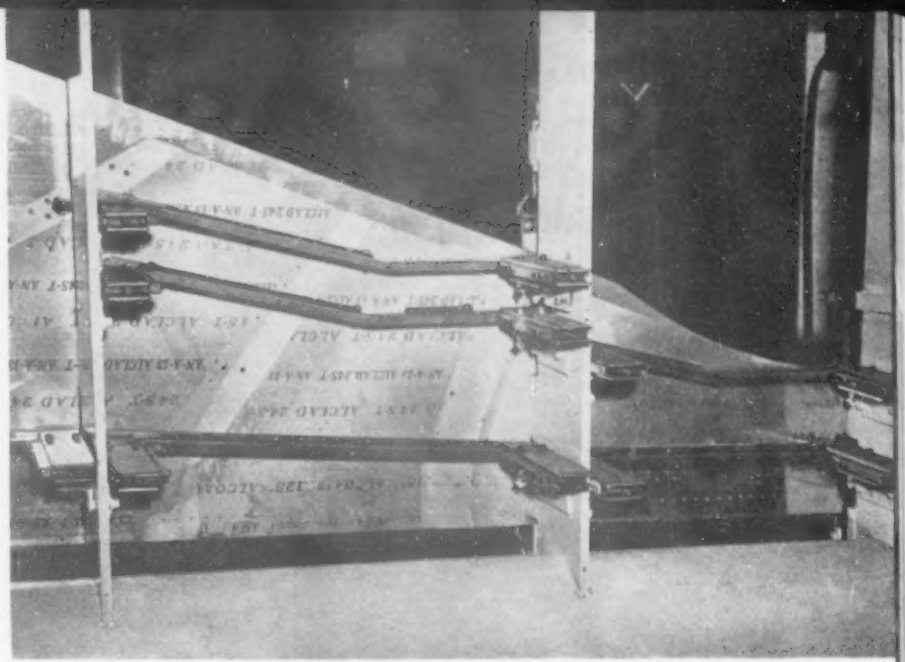
Primary advantage in the new Convair method of riveting is elimination of "oil-canning" or deforming of the skin. This is important on aircraft where absolute smoothness of contour is essential.

As explained previously, the mass of the bucking bar is always positioned so that the sheet cannot be deformed by hammering on an unsupported rivet.

In utilizing older methods of manual riveting, manufacturers have found that deformation of thin sheet metal parts is frequently caused by lack of coordination of the riveting team. Sometimes the bucking bar manipulator will support one rivet while the rivet gun operator drives another, damaging both the rivet and the material involved.

Again, the driven head of a rivet may be badly flattened or otherwise distorted because the rivet gun operator does not properly time his hammering, or because the bucking bar manipulator is fatigued and does not properly support his tool.

With the new Convair assembly, the mistakes of the bucking bar manipulator can be wholly eliminated in jig riveting because no second man is required. The assembly protects an entire row of rivet holes simultaneously, gauging the size of each driven rivet head perfectly; and the gun operator knows when to stop hammering because there is a decided change in the sound of his blows.



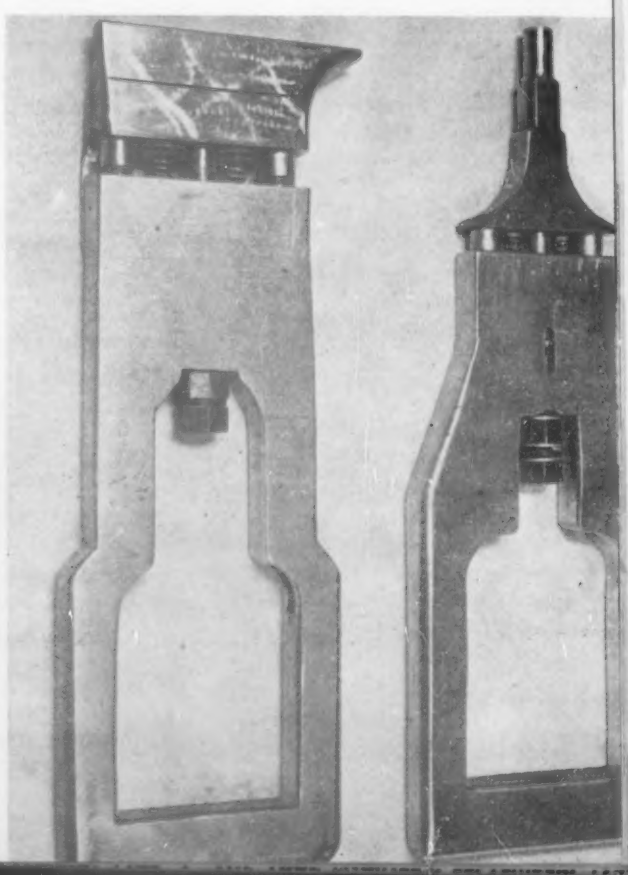
Rivet-bucking assemblies can be constructed to cover angular or curved rows of rivets.

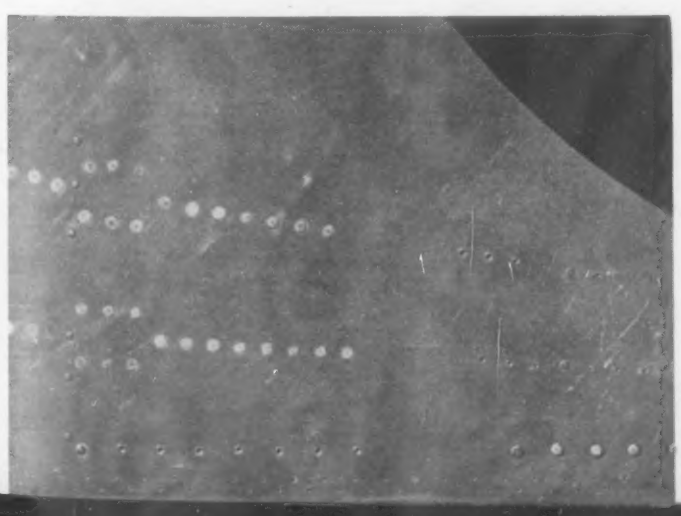
The jig riveting assembly is particularly valuable in countersunk riveting, which previously necessitated the services of highly skilled rivet teams. Even the most unskilled workman can, by means of the new setup, drive a perfect row of countersunk rivets without "oil-canning" or dimpling of the skin surface. Countersunk riveting is of especial importance in aircraft work, because the slightest obstruction on a streamlined surface can set up "drag" and alter the performance characteristics of an airplane.

The tooling cost of the Convair riveting assembly is slight in view of the savings it can effect. Experimental setups have indicated a 48 per cent saving (by time study) in the riveting of a single line of rivets. The assembly is faster than squeeze

Right: **Manual rivet-bucking assemblies are used in spots where jig assemblies are impractical. They promote efficiency by eliminating operator fatigue.**

Below: **Section of airfoil "skin" which has been countersunk-riveted. The smooth surface shows no trace of dimpling.**





Typical jig setup with rivet bucking assemblies installed.

riveting and does not require the relatively high investment in special tools. Operator fatigue is eliminated because the rivet gun does most of the work.

For riveting jobs where no jig or fixture setup is available, a variety of manual bucking bar adaptations have been created. While some of these are larger than the conventional bar, they are very light and shaped so that they can be easily handled by even a fragile woman.

The manual bucking assembly generally consists of a bucking bar shaped to suit the particular job with reacting hammers incorporated in a suitable light-weight handle.

For work on long rows of rivets, the bucking bar of the manual assembly has a face shaped like a long, thin rectangle. This enables the workman to cover several rivets simultaneously, thus eliminating the likelihood that he will support one rivet while the gun operator drives another.

For work in tight spots, where only one rivet at a time can be supported, the bucking bar on the manual assembly has a small circular face.

No marked muscular effort is required in utilizing the manual adaptation of the Convair riveting assembly. All the workman has to do is support the assembly in the proper position. The reacting hammers absorb the impact of the blows of the rivet gun. An ordinary man can provide enough strength with two or three fingers to buck rivets with this assembly. Therefore, many mistakes due to fatigue on the part of the workman are eliminated.

The manual riveting assembly is adjustable by means of a bolt extending from the bucking bar through the handle. Adjusting the bolt makes it possible for the reacting hammers to absorb all or any part of the energy expended by the rivet gun, as desired.

The Convair riveting assembly was developed by Morris Brown, 54-year-old toolmaker, who explained his intentions as follows:

"Bucking rivets was never an easy job. I have known young men who could scarcely hold their arms up after a hard day at this type of work. So I decided that if production quotas were to be maintained after all the younger men were called into the armed forces, the aircraft industry was going to need tools which would enable women and older men to do this work."

Convair is at present proceeding to convert existing riveting jigs so as to include the newly-devised method. Also, plans are being made to arrange for the production and sale of the riveting devices on a commercial basis. THE END

Broaching Stator Core Slot Openings

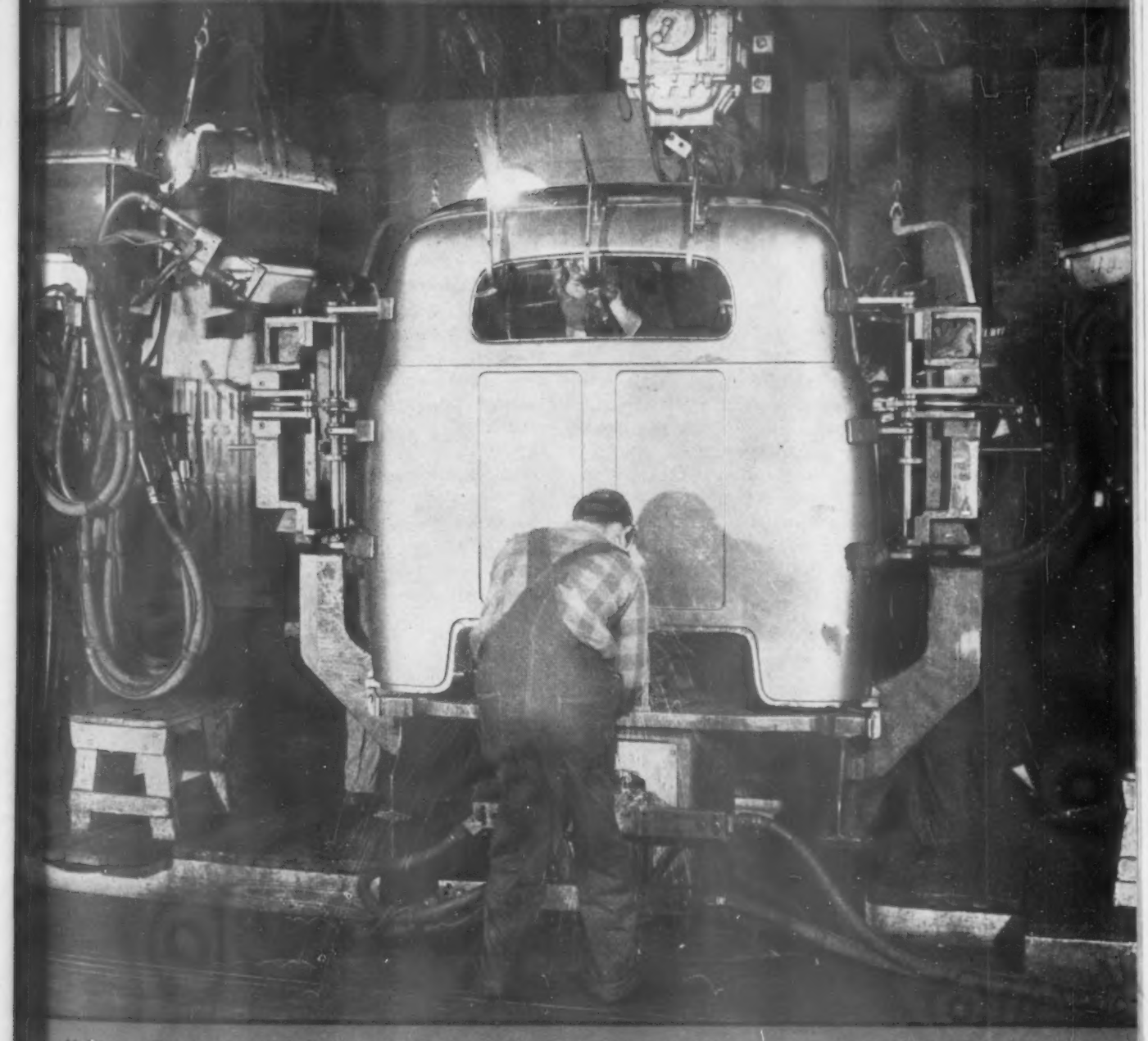
BROACHING the narrow opening of the slots in stator cores of small precision-built motors to remove burrs and small irregularities in stacking is considered the most effective method for doing the job at General Electric. C. W. Flanagan, an assistant general foreman at one of the Company's plants, developed the method. It offers definite advantages. Filing, for example, tends to open up the end section of the slots and does not clean up the center section of the work.

A broaching tool with a lead and one set of cutting teeth is started in the core by hand. Tool and stator are placed in a holding fixture with a cap for each end which fits tightly to prevent flaring of the end punchings. A small power broach is used to force the tool completely through the core, letting it fall into a padded receptacle to prevent breakage. The broaching tool may be described as "floating" with respect to the ram of the broach because of the "skew" or angular pitch of the slots.

Cores worked in this manner are suitable for winding with the finest wire, either by hand or mechanically. Also, width of openings can be held to the proper size and maintained throughout their entire length. Broaching time is about 1/5th that required for filing the core.

PRODUCTION

MACHINE AND TOOL ENGINEERING



Main assembly of cab at start of line: Top, shroud sides, back and roof and cowl top are welded together in single jig.

SPECIAL TOOLING AND MACHINES FOR ECONOMY IN PRODUCTION

Studebaker Corporation production engineers learn that mass-manufacturing methods can be applied to handle a greater number of close tolerance specifications than had previously been considered practicable. Low-cost tooling serves the purpose.

THE TOOL ENGINEER

Streamlined Production

Special Tooling and Machines for Economy in Production

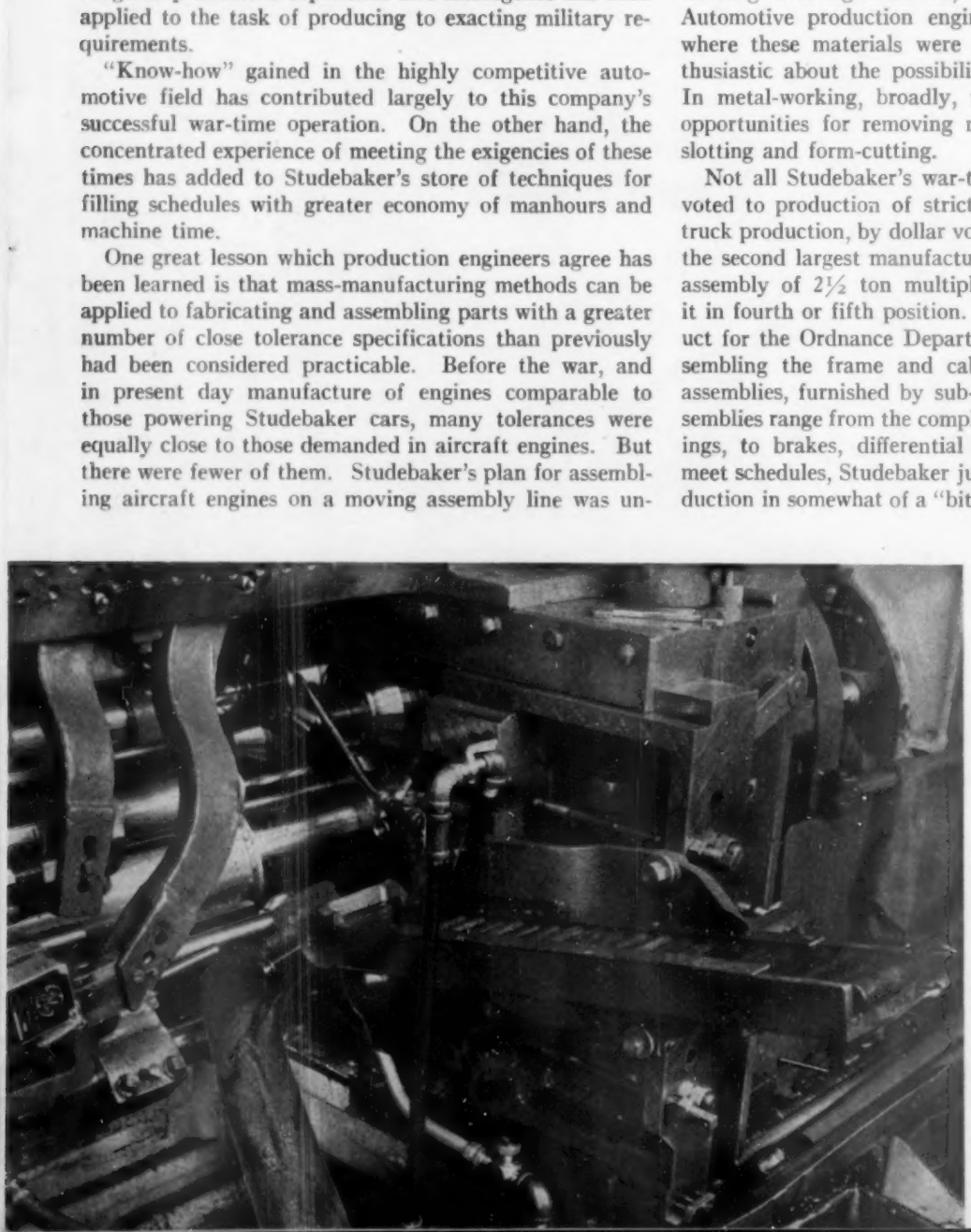
STUDEBAKER CORPORATION of South Bend, Indiana, is manufacturing a broad range of war products for combat duty and the supply services. An equally broad range of production experience and intelligence has been applied to the task of producing to exacting military requirements.

"Know-how" gained in the highly competitive automotive field has contributed largely to this company's successful war-time operation. On the other hand, the concentrated experience of meeting the exigencies of these times has added to Studebaker's store of techniques for filling schedules with greater economy of manhours and machine time.

One great lesson which production engineers agree has been learned is that mass-manufacturing methods can be applied to fabricating and assembling parts with a greater number of close tolerance specifications than previously had been considered practicable. Before the war, and in present day manufacture of engines comparable to those powering Studebaker cars, many tolerances were equally close to those demanded in aircraft engines. But there were fewer of them. Studebaker's plan for assembling aircraft engines on a moving assembly line was untested. Some aircraft firms said it couldn't be done. Studebaker proved its practicability and economy.

Then there has been the entirely new experience of working with light metals, aluminum and magnesium. Automotive production engineers assigned to the jobs where these materials were specified have become enthusiastic about the possibilities of postwar application. In metal-working, broadly, they are also intrigued by opportunities for removing metal with abrasives, as in slotting and form-cutting.

Not all Studebaker's war-time experience is being devoted to production of strictly military-type items. In truck production, by dollar volume, this company is about the second largest manufacturer. Of units produced, its assembly of 2½ ton multiple-drive vehicles has placed it in fourth or fifth position. Manufacture of this product for the Ordnance Department consists mostly of assembling the frame and cab from pre-fabricated sub-assemblies, furnished by sub-contractors. These sub-assemblies range from the completed frame and body stampings, to brakes, differential and engine. However, to meet schedules, Studebaker jumped into engine parts production in somewhat of a "bits and pieces" program.



A recent improvement in drilling and reaming each end of piston pins for Studebaker truck engines has been the replacement of four 4-spindle automatics and four turret lathes with two 8-spindle Conomatics. In center of picture is magazine loading mechanism.

Studebaker Corporation photos

Automotive production methods are a natural for Studebaker Corporation's manufacture of Army combat and service vehicles.

This company's experience as one of the largest producers of heavy-duty trucks has also served for fabrication and assembly of the Weasel, recently revealed combat car

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SPECIAL FEATURE
BY THE EDITORS

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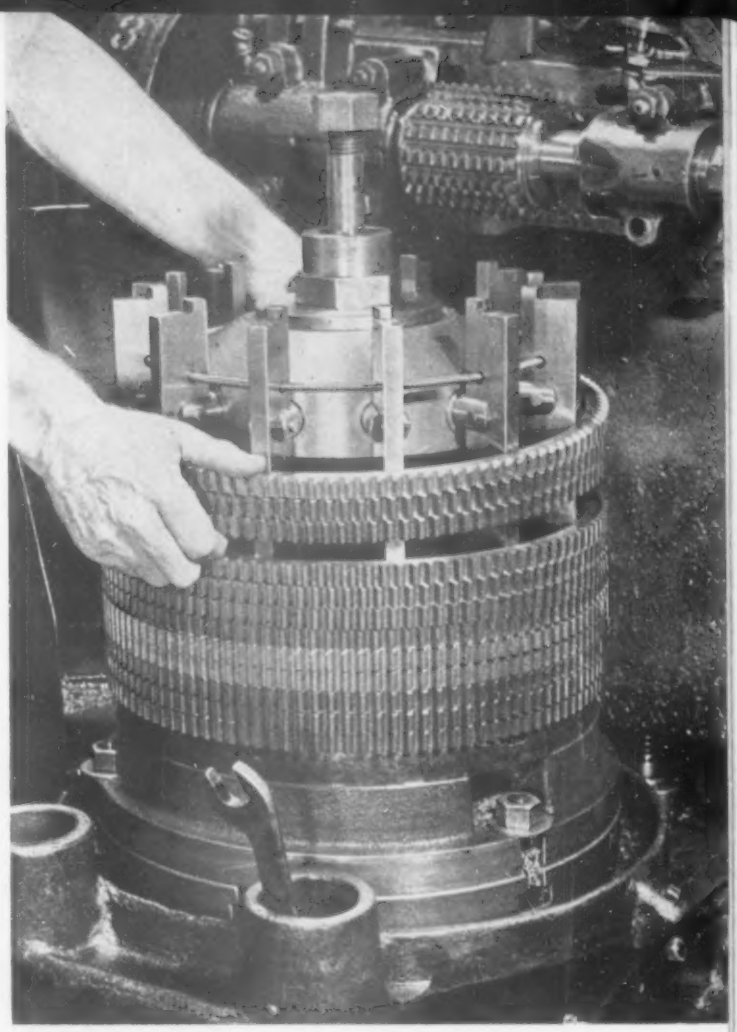


Right: **An ingenious fixture for hobbing the external gear on the flywheel ring gear, providing a high degree of efficiency on an old machine. Twenty parts are loaded on the machine for simultaneous machining.**

Without a contract for more than 10,000 parts, it adapted peacetime machines to the manufacture of crankshafts, camshafts, flywheels, piston pins and other parts. Though tooling has been designed to meet a low schedule, and thus the tendency was to tool old equipment to the job (even where new machines might have been available) a fairly economical job has been performed in supplying parts for 125,000 engines, far beyond the original contract expectations of 1941.

On one series of operations, however, a recent improvement has been the replacement of four 4-spindle automatics and four turret lathes with two 8-spindle Conomatics. The job consists of drilling and reaming in each end of the piston pin. As performed now, identical operations for separate ends of the pin are set up on each of the two automatic machines. Two step-drilling operations to produce a tapered hole, and a third operation of drilling a smaller diameter continuation, are followed by rough and finish reaming, including forming of a small radius at the bottom of the larger hole. A chamfer is formed on the O.D. of the pin from the cross-slide.

AUTOMATICS REPLACE OLDER EQUIPMENT

Toughest part of the job is determining speeds and feeds which will produce a part free from tool marks and burrs. The SAE 1020 which is formed to the same dimensional accuracy demanded of the tougher part serving in the same capacity in an aircraft engine, tends to be "mushy," making it difficult to hold the chamfer and to produce a burr-free edge between large and small holes.

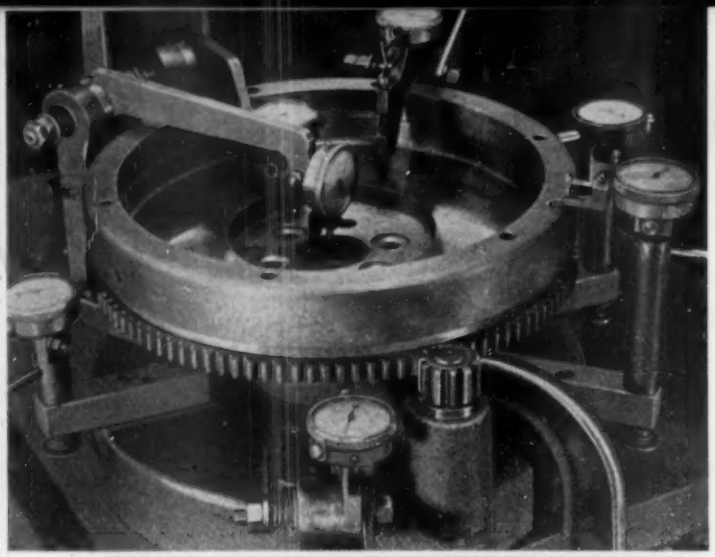
Reduced handling of the part between operations, and the finer operation of the modern equipment, has resulted in higher production and a finer finish. An incidental feature of the new machines, contributing to manhour and materials conservation, is automatic chip disposal by means of a power driven conveyer, working off a ratchet. Following the screw machine operations, the part is hardened and ground.

Crankshafts and camshafts are manufactured in keeping with conventional automotive methods. Regular belt-lappers are employed for finishing bearing surfaces. One war-time innovation has been the application of induction hardening equipment for surface treatment of pin bearings.

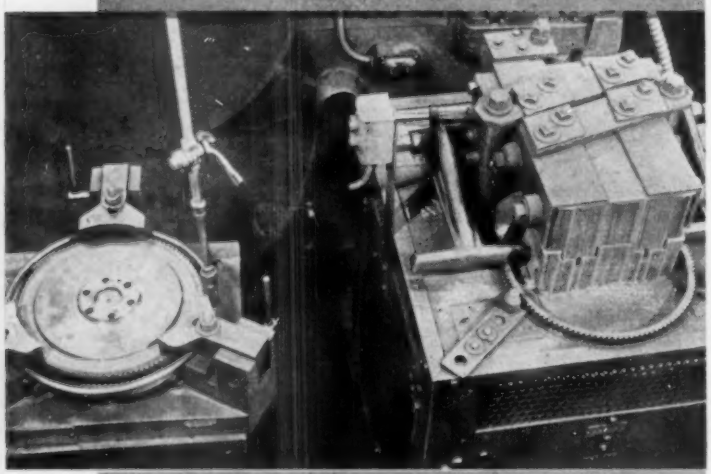
Old equipment tooled up for manufacture of fly-wheel ring gears will probably be replaced where economy will justify the expenditure. Two standard lathes now used to face and turn the I.D. and O.D. of the ring will in all probability be replaced by the first available turret lathe. This will relieve the requirement of a double setting now required in boring, facing and turning from the cross-slides of the lathes.

However, design of an ingenious fixture for hobbing the external gear on the ring has provided a high degree of efficiency on an old machine. Twenty parts are loaded on the fixture for simultaneous machining. Twelve vertical and parallel blades, spaced equidistantly around a circle serve to hold the rings securely. Blades are expanded at top and bottom, so as to both hold the rings and centralize their position with respect to the hob. This action is produced within the fixture by vertical movement of conical sections which actuate pistons against the ends of the blades. Threaded cones travel up and down a

Streamlined Production



Above: Gaging fixture for flywheel, showing pinion gear for checking teeth on the ring gear. Readings are taken on diameters, faces, rim, and bore.



Above: Ring gear is shrink-fitted to flywheel by resistance heating. The part is quickly cooled by air blast through holes around ring's inner periphery.

Below: Tire mounting fixture. Rims and tires are assembled along roller conveyer feeding to hydraulic machine which installs tire retaining ring.

vertical shaft which is turned at the top of the fixture.

Teeth are chamfered on one edge, following hobbing, and the gear is then heat-treated. Several rings are hung on a cage fixture, each ring separated from adjacent rings by ¼" blocks to permit equal head application to the surfaces. Pit-type furnaces are used, with an oil quench and dry-draw. No grinding is performed after heat-treat, operation being calculated to allow about .006" shrink on the diameter. Further heat, for expansion purposes, prior to shrink fitting, is applied on a resistance machine. About .020" expansion is sufficient for shrinking the ring gear to the flywheel.

Placed on the flywheel while hot, the part is quickly cooled to a shrink fit by a pipe surrounding the gear. Air blasted through minute apertures around the inner periphery of the ring cools the part rapidly.

MULTIPLE CHECKING FIXTURE

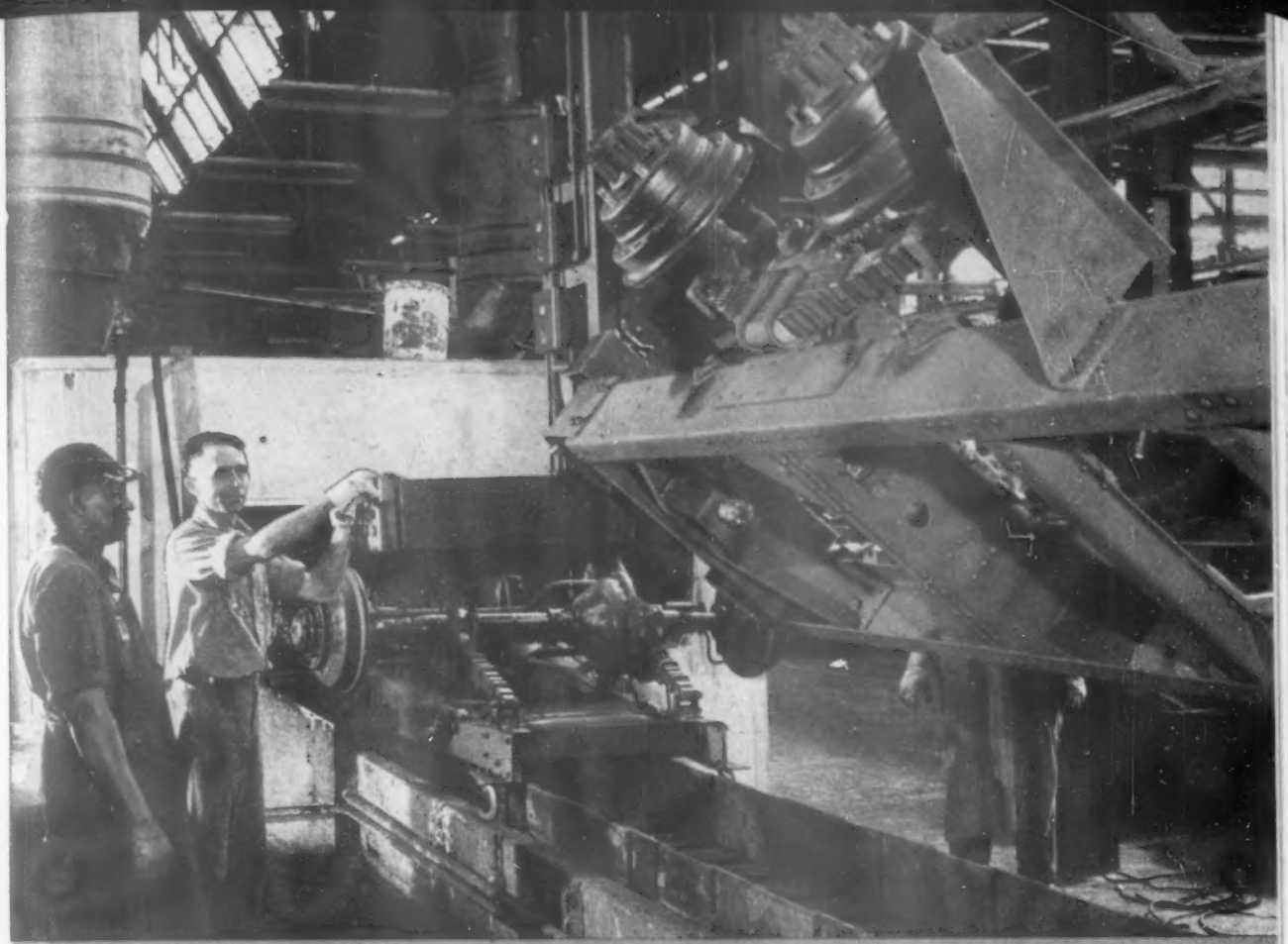
A checking fixture is used to inspect the finished flywheel throughout. Dial indicator readings are taken on diameters, faces, rim and bore, and a freely revolving pinion checks tooth accuracy. Balancing machines, operated in conjunction with a drill press, are used in the final operation on the flywheel.

In another instance, Studebaker production engineers have had the satisfaction of seeing a large section of the manufacturing world catch up with an old idea of theirs. Where several other manufacturers have resorted to the use of punch presses to produce a re-designed product, because they lacked machines conventionally applied to specific types of work, Studebaker has long stamped certain parts to obtain an improved product—and to eliminate machine hours. An example of this is the stamping of axle suspension brackets, complete with bolt holes, to accurate dimensions. Among the foremost advocates of reducing unsprung weight, engineers selected this method of producing a lighter part more economically.

BRAZING FACILITATES USE OF STAMPINGS

A companion feature of increased use of stampings has been the use of brazing in assembling or joining stamped parts to produce a strong and neatly joined component. Here again, Studebaker can point to at least five years' use of copper brazing. Press fits of tubular and bar sections to machined or stamped angles or plate sections, are followed by surrounding the joint with a copper ring and furnace brazing in an electrically-fired hydrogen atmosphere. Parts are conveyed through a 12-foot firepot at speeds as high as 7" per minute. Maximum temperature obtained with 40 and 60 KW furnaces is 2040° F. The same furnaces are used for both annealing and brazing of small parts. (A cleaning action is an accompanying benefit of passage through the furnace.)

Press fits are obtained on small horizontal, pneumatically actuated fixtures. A variety of inexpensive holding fixtures serve to maintain proper alignment of components while tubular or bar sections are forced into proper position. Emphasis is placed on obtaining as tight a fit as possible, in that tests have shown that a stronger joint, or a better braze, is produced.



Before final assembly, the chassis for a Studebaker heavy-duty military truck is turned right side up on the conveyer. This is done with a remote-control electric hoist. The operation is completed in 30 seconds.

Truck assembly at Studebaker follows conventional line production methods for the most part. There are certain departures, in principle, and two notable improvements in handling equipment. Expansion of the truck program imposed problems of space limitations on the final line. Thus, as in the modern aircraft industry, Studebaker has "backed up" much of its assembly, introducing sub-assemblies as large as possible on the final line. Axles are installed complete with brakes set and tested. Cabs with fenders are lowered on the chassis, with trim, instrument board, and other parts installed.

TRUCK FRAME INVERSION FIXTURE

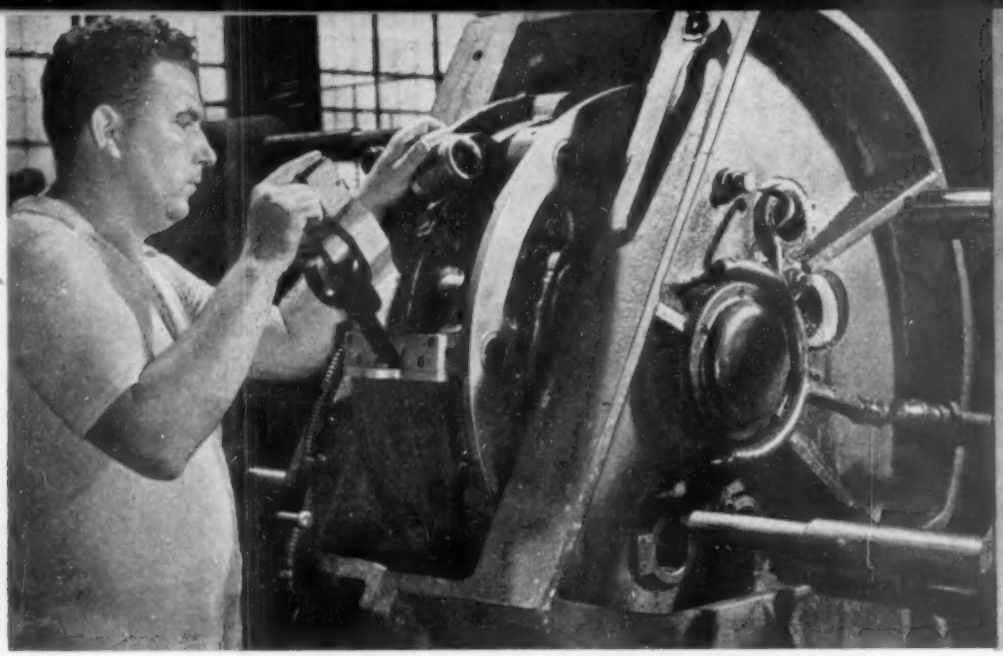
Well along in the assembly of the chassis, it is expedient to invert the frame to a right-side up position for installation of light equipment. At this point, axles, springs, and other heavy parts have been added so that the assembly weighs close to a ton. An overhead fixture, consisting of rigid vertical end sections suspended from parallel rails, is used to raise the frame and turn it over. Trunnion mechanisms, which are secured to the frame at each end, are raised within the vertical end sections. Application of power within one of the trunnion setups results in turning the frame 180°.

Hooks suspended within the trunnion mechanisms raise each corner of the frame against rigid arms or brackets. These brackets in turn become the surfaces on which the frame rests as the inversion progresses. Overhead parallel rails permit horizontal travel of the vertical end sections to pre-selected positions so that the machine is quickly adaptable to three frame sizes.

Frame assembly progresses in a single line, with stock feeding perpendicularly from storage space on both sides of the line as well as from some sub-assembly areas. One improved sub-assembly operation concerns packing of grease in roller bearings. Bearing assemblies are enclosed in small cylindrical chambers where grease is fed in metered amounts under hydraulic pressure.

Tools for chassis assembly largely consists of pneumatic yoke riveters, suspended above the line, and pneumatic wrenches. The light impact wrenches are an important factor in reducing assembly fatigue. They will tighten ½" bolts upon impact with the head without building up torque in the wrench or holder. Familiar older types required that the operator grasp the long handles firmly to prevent losing control of the tool while the torque increased as the resistance developed between the bolt and the power driven socket.

Toward the end of chassis assembly, a tire mounting fixture is employed which has speeded operations and relieved operators of a tiring job. Rims and tires are assembled quickly along a roller conveyer feeding to a hydraulic machine which automatically installs the tire retaining ring. Vertical bevelled pins rise upon pedal actuation to center the rim and loose tire assembly on a hori-



Snyder 2-way boring machine that is used to bore bogie bearing supports. Seen in picture at left are the spindles on one side of the work-holding fixture.

●

Lower left corner: Truck parts on a conveyor at Studebaker are fed into brazing furnace.

zontal plate and beneath the machine.

The ring is placed over the rim in such a manner that slight, diametrically opposed recesses on the ring are properly situated. These recesses tend to produce an oval on the inner periphery, even for assisting in the manual installation of the ring. The old method, in fact, consisted of standing on the ring on one side and pounding the opposite side so that as the ring was stretched, the oval was reduced. As the wider section of the inner periphery was narrowed to match the diameter of the rim, the narrow section was stretched to slip over the rim. Momentarily, the diameter all the way around exceeded that of the rim.

As performed on the machine, two pistons descend to hold the rim firmly on one side, depressing it beneath the flange. On the other side, three fingers, spaced a few inches apart on the ring circumference, move downward and outward against the head of the ring. They stretch the ring sufficiently to slip it over the rim. With their release, the ring springs back into normal position. The same ring-stretching principle is obviously employed.

Cab assembly consists of welding up stampings, some of which are panels previously welded together by the subcontractor. Main parts consist of dash and floor, shroud sides, roof and cowl top, back, doors and sills.

HEAVY-DUTY TRUCK ASSEMBLY

Main assembly is performed at the start of the line when top, shroud sides, back and roof and cowl top are welded together in a single jig. The jig includes a base and four angular columns. The columns carry horizontal locating and clamping arms which support the parts, holding them ready for welding. In addition, some independent C-clamps, actuated by toggles, are used to secure corner sections. Location of dash and side panels is obtained by means of pins inserted through mating holes.

Twelve gun welders powered by seven transformers are suspended at working height around the jig. Rapid operation is possible. Spots along non-stressed areas or joints where the shape of the structure is such that support is gained, are spaced 1¼" to 1½" apart. Lap welds on flat seams are in the majority.

Throughout the moving line, gun welders are used for the most part, with arc and acetylene welding being employed where easy access permits, or where additional strength is required, as in assembling bracket supports to the body, or at corner joints.

Belt sanders, complete with vacuum systems to pick up dust, are used in metal finishing.

Complete cab body is cleaned and Bonderized in a 750-foot line. Cleaning is performed with soap spray and rinse. Paint primer is applied in booths at the end of the line. A second line, paralleling but moving in the opposite direction to the first, includes a drying kiln. Finish paint precedes fit and trim lines, and instrument panel installation. Complete with sound and vibration deadeners, the cab is a well-constructed product.

FABRICATION AND ASSEMBLY OF THE WEASEL

Streamlined Production

IN THE PRODUCTION of the Weasel, a versatile tractor type vehicle, Studebaker has taken advantage of long experience in mass-manufacturing. Fabrication of both the standard 6-cylinder engine and of the all-welded hull of the track-laying conveyance has benefited from application of techniques which economize on the use of man-hours, materials and machine time.

Use of a conventional automotive engine permitted broad employment of equipment which served ably in peacetime output. Modern crankshaft and camshaft lines incorporate up-to-date turning and lapping equipment. One of the outstanding automatic handling fixtures in the plant is a machine designed for direct application of babbitt metal to the bearing of the connecting rod, eliminating the steel-backed liner, and the assembly of the loose part.

AUTOMATIC BABBITT APPLICATION

The babbitting fixture consists of a 12-foot diameter rotary table with fourteen stations. Each station has the same function, holding an individual rod for the application of molten babbitt metal, and serving in a storage capacity during a two-minute cooling cycle.

Rods are clamped, one to each station, by means of quick-acting air clamps, against a vertical face plate. The clamp includes a small cover plate which extends across the head of the rod, with a hole somewhat less than that of the bearing centered over the head.

Through actuation of individual controls, the holding plate starts revolving at a point on a rotary table and travels a few feet ahead of the station for application of babbitt metal. When a top speed of 600 rpm has been reached, molten babbitt is poured into the bearing through the hole in the cover plate. Centrifugal force is sufficient to distribute the metal evenly. A hand ladle meters the volume of metal exactly.

One revolution of the table completes the cooling cycle. Face plates stop revolving automatically to permit unloading of the piston rod. Seven rods are completed every minute.

Previous to loading in the babbitting fixture, rods are cleaned by passage on a conveyer through a hot solution. The conveyer carries them to a point convenient to loading.

Following babbitt application, excess metal is removed. Rods are clamped in a small indexing fixture which carries them beneath the spindle of a Krueger special machine. A 2-blade tool feeds in quickly to remove the rough excess adhering to the edges of the bearing.

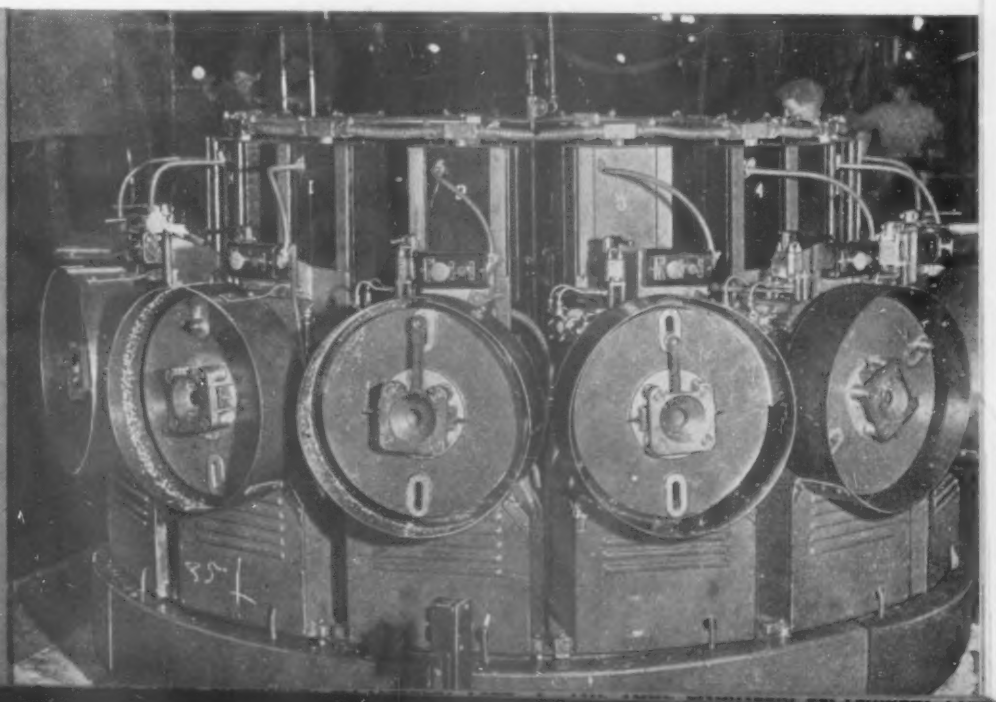
In splitting the cap off the head of the rod, a vertical broaching machine, provided with a double indexing fixture, has replaced the slower milling operation conventionally used. The improved method actually performs a sawing action in making a ¾" cut.

Two pistons operate reciprocally so that a rod is always in process. One station is idle long enough to permit loading and unloading during the return of the tools. Two broaches, with cutting edges facing each other, are actuated by each piston.

BROACH SPLITS PISTON ROD CAP

A spring-loading type holding fixture provides sufficiently positive clamping action for the broaching operation. However, it also takes parts with slightly variable thicknesses, a condition that naturally exists in forgings before machining. Sides are machined later, as one of the final operations after the cap has been reassembled to the piston rod body.

Assembly of the Weasel hull consists of a series of welding operations, culminating in the joining of two major sub-assemblies. These sections are the long, narrow, box-like bottom structure, and the upper sides, including the



A rotary table, 14-station machine enables direct application of babbitt metal to the bearing of the Weasel engine connecting rod. Steel-backed liner, and assembly of loose parts, are rendered unnecessary.

In splitting the cap off the head of Weasel connecting rods, a vertical broaching machine with a double indexing fixture has replaced the slower milling operation conventionally used.

"freeboard" which extends over the tracks.

The two sections are welded in an upside down position on a fixture. Actual structural joining is performed only along each of the long sides, through lap welding of a broad angle extension of the upper section over the side of the lower section.

A uniform weld pattern is produced by means of wooden templates laid over the areas to be welded on each side of the hull. The templates are grooved to guide the paths of independently suspended electrodes of a single gun welder. Sides are welded simultaneously, operators guiding each electrode along the channels designated by the template. One of the operators actuates the welder, causing a charge of current to travel between the electrodes through a stationary back-bar which is built into the jig.

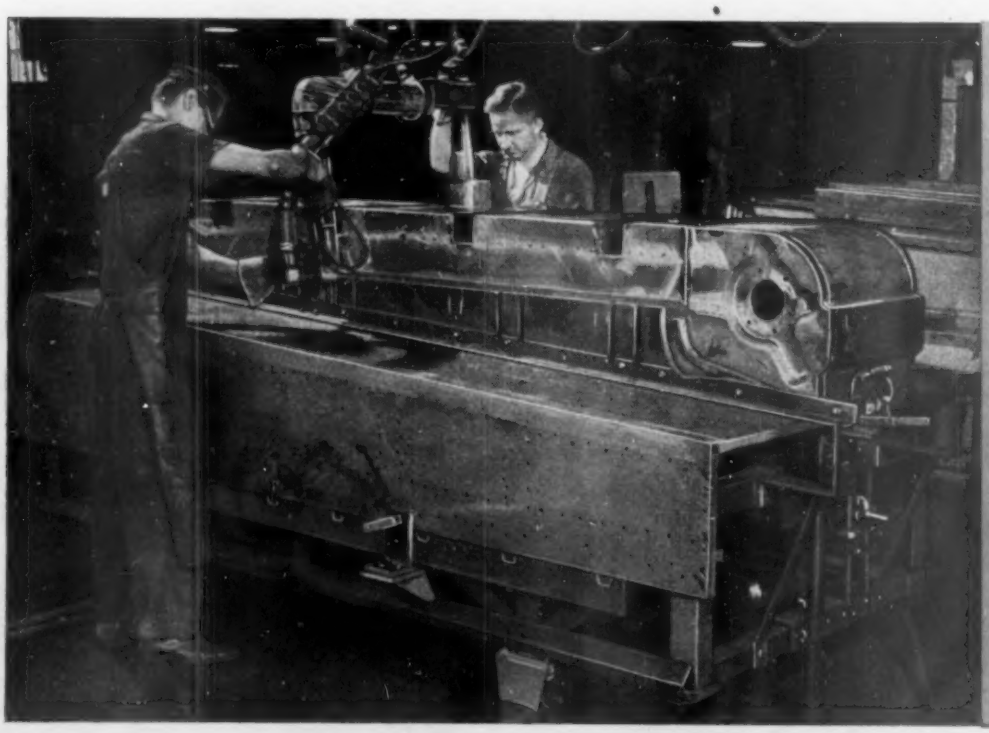
HULL WELDING FIXTURE

Welding equipment is suspended from a monorail. A power-driven carriage moves the equipment along the rail at a set pace, as determined by a variable-speed power drive, controlled through a spring balance which relieves the operators of any need for "horsing" the equipment up or down.

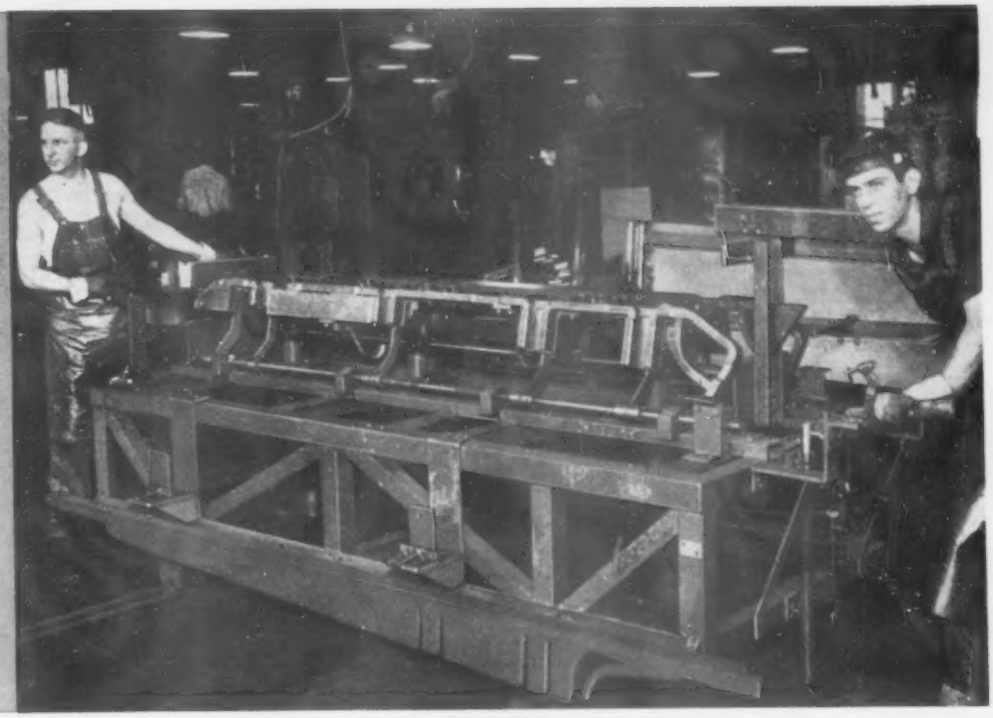
Locating clamps secure the two large hull sections on the fixture, as illustrated. Bars through the axle holes of the lower section rest on V-blocks, controlling the longitudinal positioning. In turn, pins through coinciding holes in upper sections maintain overall alignment. The copper back-bar is a fairly elaborate and heavy grill, which is hinged to swing downward and outward. Pneumatic force presses it against the work to provide a good contact, and to assist in securing the parts to the fixture.

Without doubt, many automotive production engineers have been intrigued by the increased flexibility in special machine tooling which war production has fostered. It has permitted product design changes with greater manufacturing economy.

Studebaker's experience in the aircraft engine field, utilizing automatic handling equipment which performs almost complete machining of a cylinder head, has been



Assembly of the Weasel hull consists of a series of welding operations, culminating in the joining of two major sub-assemblies upside down in a fixture.



An intricate fixture used in welding hull section of the Weasel. Welding equipment is suspended from a power-driven carriage on an overhead monorail.

an outstanding example. Controls and machines are adjustable enough to permit removal or addition of equipment on the automatic "line," either to improve the equipment or to meet product changes.

However, where new machinery could not be obtained in the Studebaker plants, production men have demonstrated a certain flexibility in their own ingenuity to adapt single purpose equipment to meet the needs of manufacturing items quite unlike those for which the machines were originally designed.

For example, in performing two multiple drilling operations on the front of the Weasel hull, and in boring axle supports at the rear, four single-spindle drill presses have been utilized. The fixtures were placed in a horizontal position on the floor, two of them being provided with multiple-spindle auxiliary heads, and two of them with boring bars. Secured in proper alignment, the combination became in effect a special machine. Future possibilities for setting up portable heads adaptable to a variety of operations is suggested in this application.

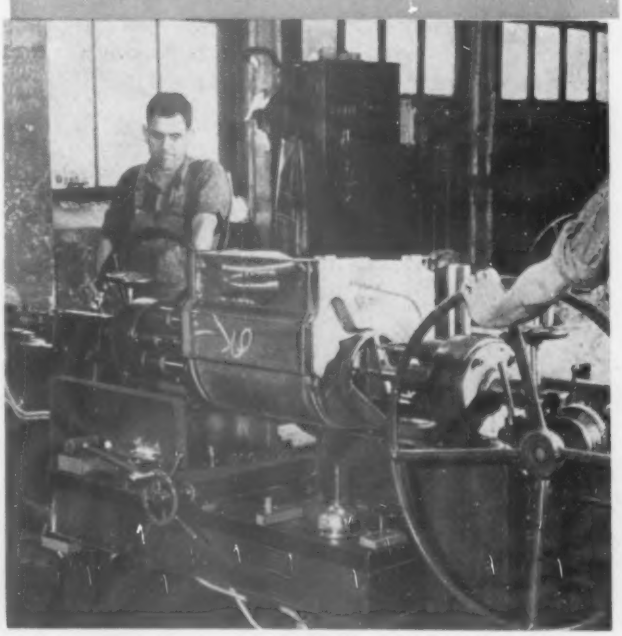
SPECIAL PURPOSE BORING MACHINE

In another instance, malleable iron bearing supports are bored on a Snyder machine originally designed to bore passenger car axle supports. The 2-way automatic fixture mounts two opposed heads, each carrying three spindles. But spacing of the spindles is such that no logical relationship is provided with regard to the work now being done. By building a work-holding fixture, however, which would rotate in a vertical plane between the opposed heads, spindles can perform individual jobs on rough, semi-finish and finish boring.

Parts are quickly clamped in the holding fixture between parallel rims. Because spacing from one spindle to the next exceeds that of the dimensions of the part, three or four idle stations have resulted, not counting a loading and unloading station.

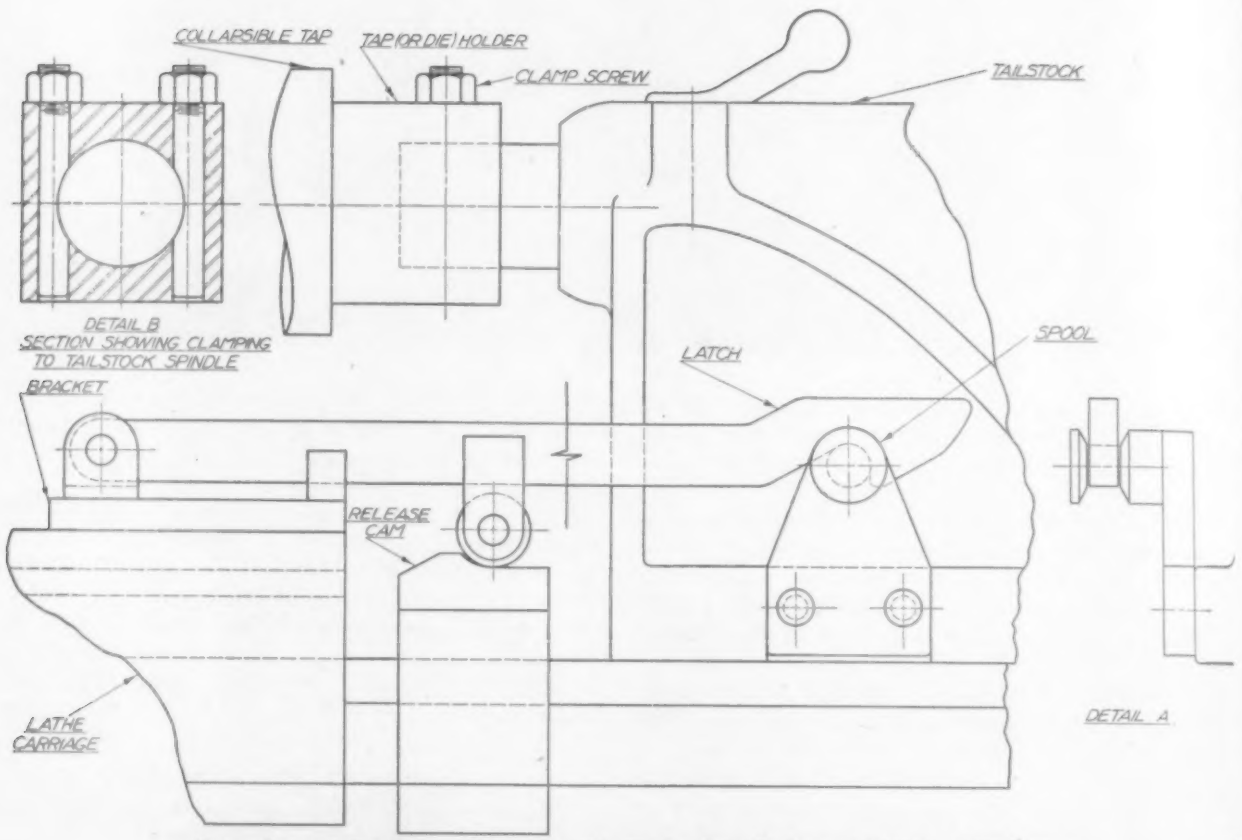
However, because no increase in investment has been made beyond that of building a slightly larger holding fixture than would have been necessary with a machine designed for the job, there is no loss of man-hours, materials or machine time. There is the economy of using an efficient special purpose machine which would have been idle if fixture design had not made it adaptable to a war production job. THE END

Through use of fixtures, single-spindle drill presses with auxiliary heads perform special purpose work in multiple drilling operations on the Weasel hull.



Tapping and drilling methods described here are not war babies. They may economically supplement conventional lathe practice. Attachments may be used and re-used profitably on long or short runs

TWO JOBS FOR THE ENGINE LATHE



Setup for tapping large diameters and coarse threads from tailstock. Carriage, geared to proper lead, drags tailstock in feed to work.

HEAVY TAPPING

TAPPING on the engine lathe, with the tap held in a tailstock chuck or holder, may seem rather elementary at first thought. "We've done that for years!" When, however, the job involves large diameters and coarse threads that tax the grip of the taper, and it further involves taps or dies that must collapse on the split second, then, ruggedness and absolute control are prime requisites. And for control, a lead screw must be used, or the thread may strip—in fact, will strip in altogether too many instances.

A tried, proven and workable tapping attachment is shown, in its simpler elements, in the drawing. Here, various turning, boring or facing operations (not shown) may be performed by means of a tool post turret, each controlled by individual stops, either specially designed or purchasable as standard accessories.

Instead of the taper, the tap—or die—is held in a holder clamped to the O. D. of the tailstock spindle, which is then locked. During the threading operation the entire tailstock slides on the ways, being dragged along by the carriage which, in turn, is geared to the proper lead. A drag link—or latch—is the actuating medium. The drag link is provided with a roller which, riding a cam at the desired depth of thread, automatically kicks out with the collapse of the tap.

The kickout is a safety, permitting tapping close to a shoulder without damage to the tap or injury to the workpiece. With it, the operator just can't "forget." A reverse dog may be incorporated on the drag link, thereby enabling the operator to return the tailstock to "clear" position, by means of carriage hand feed, if it is not provided with a crank return.

As shown, the drag link is attached to a bracket clamped to the apron, while a spool (Detail A) is fitted to the tailstock. To engage, the carriage is merely moved rearward until the beveled lead-on of the link rides over the spool and drops into place. Engagement effected, the carriage—with tailstock following—is then moved ahead until the tap almost

enters, when the lead screw nut is engaged. The result is a thread as accurate as the lead of the tap, the assumption being that the lead screw is practically accurate.

Detail B is a section through the tap holder, showing a recommended locking clamp or clamps. This method of clamping is recommended because of its almost unbreakable grip and because it does not mar the surface clamped. It has been widely used by the writer over a period of years, with satisfactory results.

In manufacture, the lock pin holes are bored with centers slightly outside the diameter of the major hole—as for example, $\frac{1}{8}$″ over for a 1″ pin—and with the holes reamed press fit. Thereby, commercial C. R. S. rod can be used or, in the smaller sizes, drill rod. One end is threaded. The pins are pressed into their holes and bored together with the major hole, which is fitted to the spindle or shaft, slip fit. The pins are then removed and, in turn, dressed down to a slip fit. Once installed, and the nuts drawn tight, the clamps will hold securely and, as aforesaid, without marring the spindle. A slight turn of the lock nuts, and a tap with a soft hammer, and the entire unit slips easily off.

With the method shown—i. e., combination of tool post turret, individual stops and the lead screw controlled feed of tap, production can be obtained on an engine lathe that compares very favorably with the output of a turret lathe. As a matter of fact, it is a logical method when heavy, repetitive threading is required, and it has further advantage in that, if an especially smooth thread is required, the thread can be prechased with a conventional threading tool.

—A. E. RYLANDER

DRILLING ATTACHMENT

AN ENGINE LATHE has been tooled successfully for high production drilling of 200 holes in 6″ drain pipes for surface condensers. The pipes are 18′ 6″ long. A special holder, designed to hold two air drilling machines, so spaced as to maintain the proper pitch, is provided.

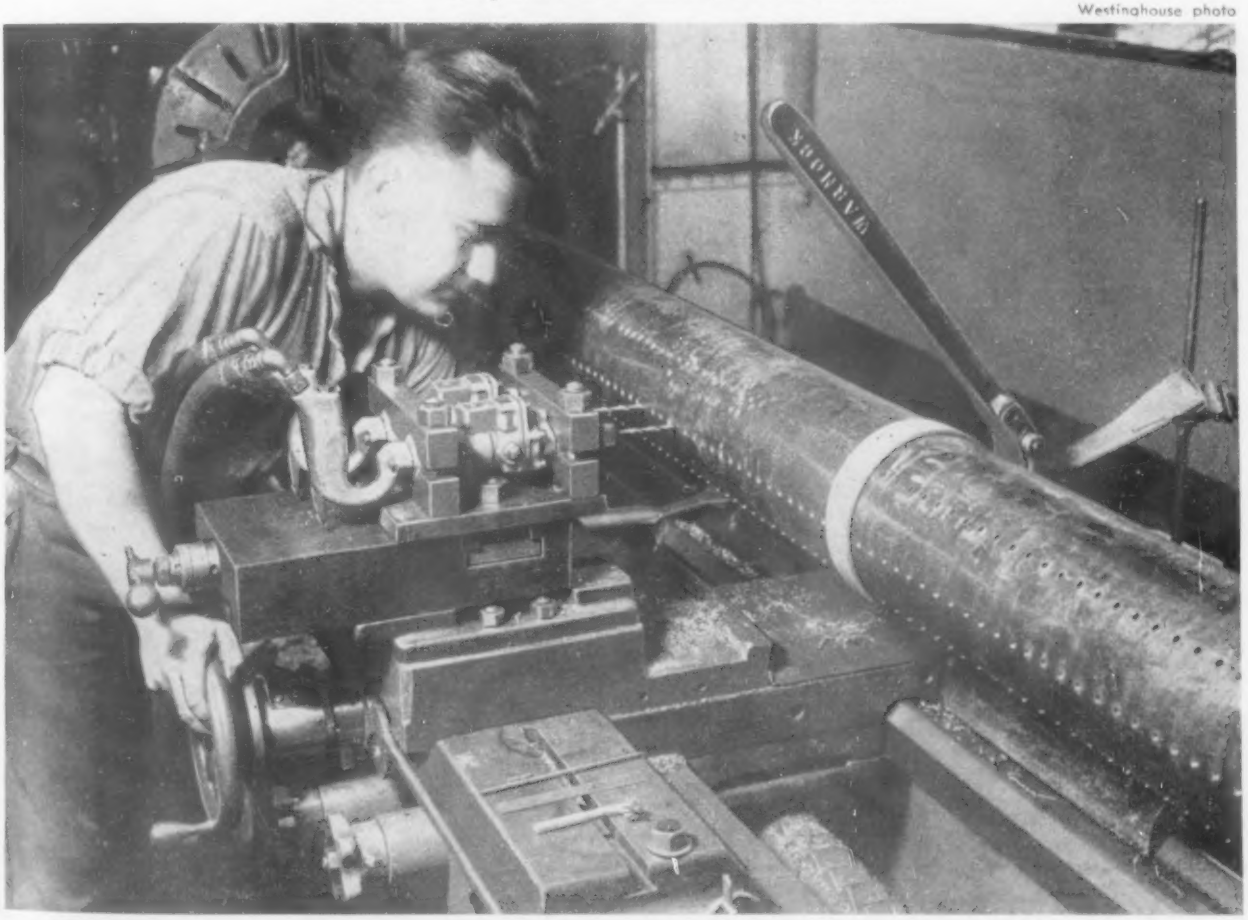
The holder is bolted in place in the compound tool holder slot. Two holes are drilled at one time. Hand feed is used to spot the holes and then the cross feed is engaged and the holes are drilled through.

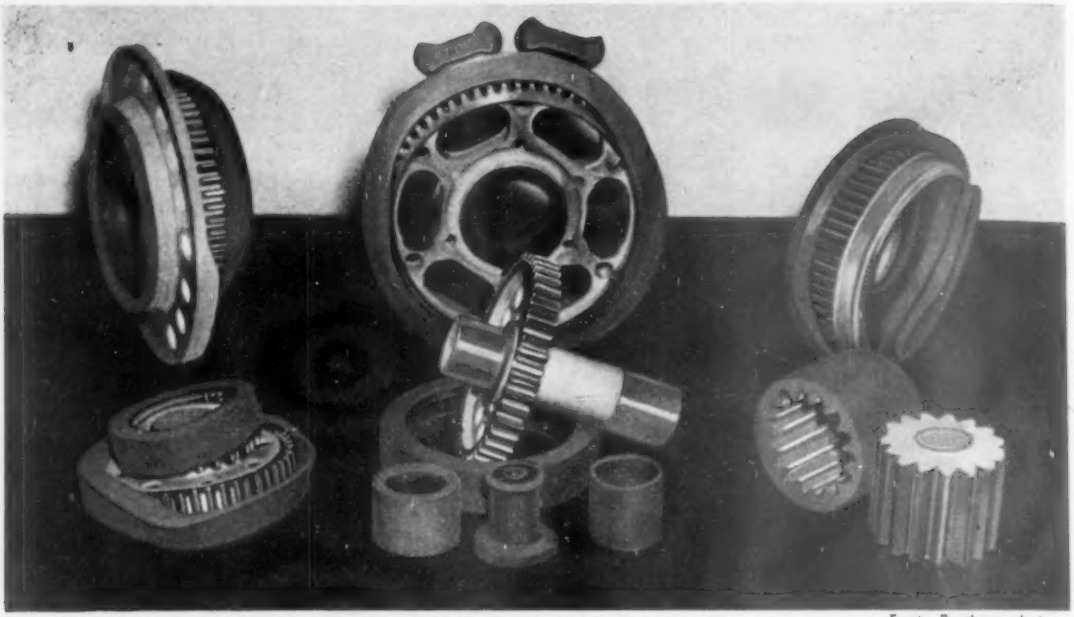
With this setup, it is only necessary to lay out the first hole in each row. A micrometer stop attached to the ways, used in conjunction with block, plug and pin gages, provides accurate spacing. To move from one row to another, the face place is turned by hand, and the drill is aligned according to layout.

—J. BEHAN, *Westinghouse Electric & Manufacturing Company*

Engine lathe set up to drill holes in 6" drain pipes for surface condensers. Only first hole in each row need be laid out.

Westinghouse photo





Foote Brothers photos

Representative gears which are selectively carburized. Note rubber masks used in stopping off copper plating.

RUBBER MASKING FOR SELECTIVE PLATING

H. N. NILSON
CHIEF METALLURGIST
FOOTE BROTHERS
GEAR AND MACHINE CORPORATION

MOST AIRCRAFT engine gears are selectively carburized to produce maximum hardness for wearing surfaces, and maximum toughness for all other areas. In processing a gear of this type, the conventional method has been to rough machine, copper plate all over, and then machine the copper from the areas requiring a carburized surface. Following plating and removing copper from centers and bores of gears, a troublesome lapping or polishing operation was required before the work could be mounted between centers or on arbors. Further, points of location were difficult or impossible to maintain on the soft copper plate, and handling for mass production machining produced scratches and nicks in the copper. These factors allowed the carburizing gases to penetrate the plate, ultimately causing hard spots in the gear and poor quality.

As a result of this experience, Foote Brothers Gear and Machine Corporation began searching for a means of stopping off the copper directly, in the plating solution. To be of definite benefit, however, such a means had to be positive and inexpensive. To further heighten interest in the matter, production engineers were called upon to manufacture a gear with plate extending part way along the involutes of the teeth. The only possible means of doing this demanded selective plating of the copper to the specification.

Results of experiments

The first type of stop-off material tested for selective plating was a high melting point wax. Gears were dipped into this wax with suitable masks to keep wax off the areas requiring plate and were then allowed to dry. This process required several dippings and usually scraping and scrubbing to produce a clean straight wax edge. Traces of wax on areas to be plated resulted in poor plating, and were almost impossible to clean. Furthermore, when these parts were put in the hot plating solution, the wax became soft and permitted a creepage of the copper plate on the areas required to be plate free. The net result was an inconsistent, costly operation demanding much re-work.

Next, experiments were with various tapes, such as rubber, wax and scotch masking. A battery of workers continually applied the tape over the areas to be plate free. The work was then copper plated and more workers began the job of removing the tape. Besides being costly from the standpoint of the amount of material and labor required for mass production of gears, there was the problem of nicking and scratching of the parts by the knives and picks used in working the tape.

Various plating stop-off lacquers to be sprayed or brushed on the plate free areas were then tried, but two or three coats were required to provide a heavy enough finish. This factor presented a distinct time lapse for drying each coat which was awkward from a production standpoint. It was, further, necessary to design many fragile spray jigs which would keep the lacquer off areas requiring plating, yet which would be small enough to permit full application of the spray pattern. Such tools required frequent replacement, even with careful handling by skilled operators.

However, even with consideration for all these factors, there was usually enough creep of the plate under the

Search for a low-cost method of "stopping off" copper plating for selective carburization was intensified by need for partly plating tooth involutes. Foote Brothers Gear and Machine Corporation's simple rubber masks improved over wax, tapes, and stop-off lacquers

Lacquer spraying of areas to be carburized proved less effective than the application of simple rubber masks.

edge of the lacquer to result in a ragged job, frequently requiring rework. While lacquering does the job fairly well in high production, labor costs are high and removal of the lacquer following plating is difficult. The dried film of lacquer also presents a disposal problem and a fire hazard.

The final and successful step in the investigation began with consultation with a rubber company toward designing rubber molds that would stand up in the plating solution and simplify stop-off problems.

The first rubber masks were designed to conform strictly to the surface marked. Gear teeth were filled with molded rubber, so that the rubber followed all contours of the part. Because of tolerances in the gears, however, the masks did not fit all parts equally. The most successful design proved to be one of not fitting the mask closely to the area to be covered, but of merely arranging the shape to have a compressive stress at the points of sealing.

To obtain this feature, care must be taken to calculate shrinkage of the rubber mask as molded so that the required stretch will be obtained on the final product. Also, rubber masks must be designed carefully so that they do not shade off plated areas of the part, preventing a uniform depth of plate. The best mask material for copper plating has proved to be a pure rubber stock which holds its shape indefinitely while having the additional advantage of floating in the water rinse tanks. The majority of plated work can be successfully rubber masked, but in some instances certain minor changes in the areas specified to be masked are necessary for simplification.

Rubber masking has not been, and probably will not be, a fool proof process, but it has permitted great strides toward faster output and decreased cost. To successfully use rubber masks, a definite handling system must be organized. Masks should be thoroughly wet before fitting to the gears, because this makes them slip on much easier. Previous to masking, gears are racked and run through the necessary cleaning cycle for plat-

View of rinse tanks shows variety of masks used in selective copper plating.

ing. If masked gears are passed through cleaner and acid tanks, the rubber tends to carry these solutions into the plating tank and contaminate the electrolyte.

Men who put on the wet masks should wear rubber gloves as a protection against finger staining the parts. Actual masking is followed only by a cold water rinse and plating. After plating, the gears are water rinsed and the masks are removed. The gears are then alkali cleaned and rinsed to remove the dark smut that has formed under the rubber masks. By means of a wire basket, masks are dipped in a cleaner and water rinse and stored in bins.

After the gear has been plated, there may be a "flash" of copper under the rubber mask, usually caused by improper assembly, or because the mask is worn. Generally not more than .0002" thick, the flash may be removed easily by running the parts in a chromic acid copper strip tank for ½ minute. Such a brief exposure is not enough to materially affect the .002" thickness of plate desired on other areas. However, good practice includes checking the plate thickness with a standard magna gage plate thickness tester after flash stripping. Fixtures have been devised for selective stripping of areas where plate has crept on difficult masking jobs. Even with poor results on some of these jobs, finish correction is possible without entire re-working.

Rubber masking has become one of Foote Brothers most effective methods in process routing gears. Many turning and grinding operations are eliminated, production cycles are reduced, and production control is made easier. Parts formerly plated, returned to the machine shop, carburized, returned to the machine shop, and ultimately hardened, are now simply machined complete, copper plated, carburized and hardened.

Negative Strength Land Increases Carbide Tool Life On Scaly Work Hardening Steel

A METHOD of overcoming tool troubles caused by a combination of scale and the work hardening of stainless steel forgings was evolved recently on a job involving turning and facing operations on supercharger rotor turbines with cemented carbide tipped tools.

When machining this part (see Figure 1), it was noted that failures on tools occurred at any point where the tool was cutting a previously machined surface and also at the scale line. The former trouble was found to be caused by rapid work hardening of the particular analysis of stainless steel being machined. Hardness penetrated to a depth of several thousandths of an inch. For that reason, a feed above .008" was maintained, and the difficulties resulting from the carbide tipped tool cutting through work hardened stock were eliminated.

FIGURE 1.

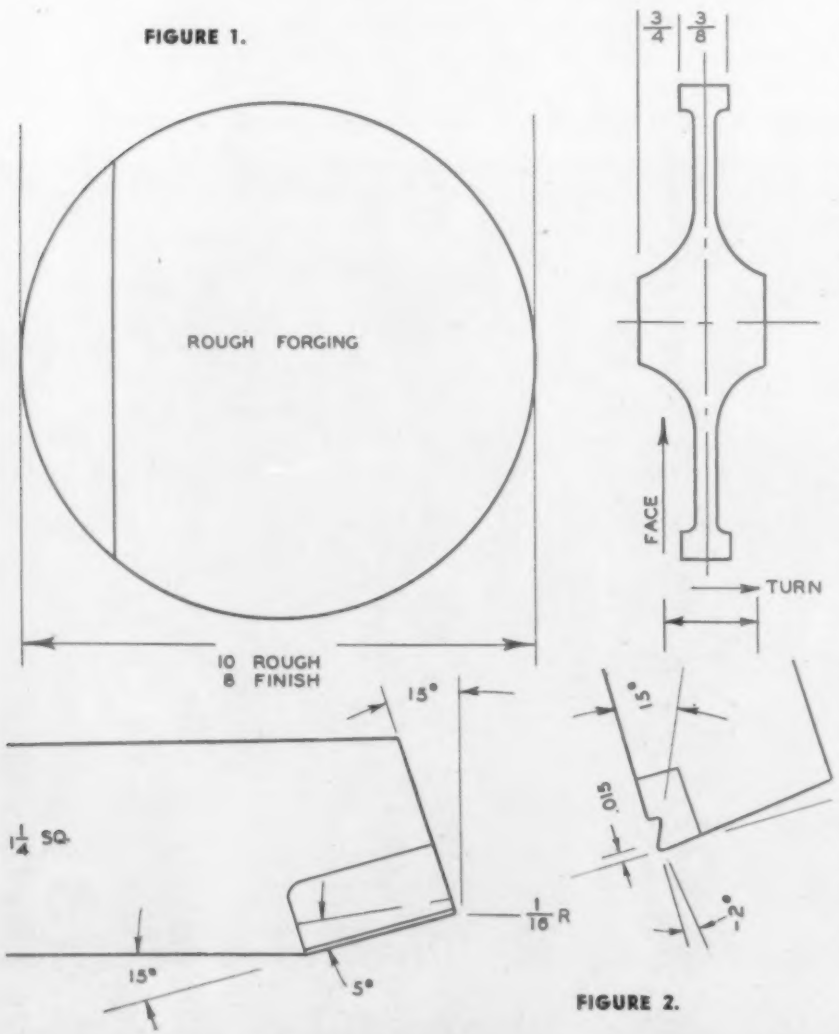


FIGURE 2.

The tool design illustrated in Figure 2 was worked out to furnish the added strength and chip breaking qualities needed when cutting through the scale on the stainless steel forgings. A negative strength land on the tool reduces the tendency of the material to tear out the tool's cutting edge.

A reverse angle chip breaker of from 4° to 5° prevents the chip from curling back and impinging against the cutting edge at approximately the scale line as it would otherwise do on this particular setup. In this instance, it was found that the best way to put the chip breaker in was to grind a regular breaker at 15° positive rake at a reverse angle to the cutting edge. After the breaker is in, a land of from —2° to —3° and .015" wide is ground on a 6" diamond pedestal grinder.

With the tool illustrated, an average of 10 pieces was faced and turned between grinds, although the part had a Brinell hardness of 280 to 320. Speed was 140 to 160 sfpm, with a depth of cut of 1½".

AIDS TO HIGH PRODUCTION TAPPING

Increased use of universal tapping and threading machines has sharpened need for information on speeds and feed, drill sizes for the per cent of thread desired, lubrication, and hole preparation. Here is up-to-the-minute data from an authority

MARK GRAVES
CHIEF ENGINEER
THE CLEVELAND
TAPPING MACHINE COMPANY

ALTHOUGH machine tapping on lathes or specially designed machines has been performed in the United States since about 1870, and has reached fairly high production rates on some types of work, no universal automatic tapping and threading machine, readily adaptable for a wide variety of uses, was developed until a few years before World War II.

Consequently, while plants engaged in the production tapping of nuts or similar threaded products possess a certain amount of specialized knowledge relating to their own work and their own types of machines, there has been a lack of up-to-date broadly applicable information published on tapping procedures. At the same time, increasing use of the modern universal tapping and threading machine is multiplying the need for reliable data concerning the most efficient operation.

A universal tapping and threading machine may be defined as one which may be used to tap or thread a wide variety of work; which may be converted from one job to another simply, easily, and with minimum time loss; which can be operated efficiently by semi-skilled workers, and which will achieve both high speed and high accuracy in automatic operation.

There are four main requirements for such a machine:

1. The tap or die must be lead-screw controlled, and the lead screw must be readily accessible and easily changed.
2. The machine should afford a speed range of approximately 10 to 1.
3. Limit switches and motors should be adjusted precisely enough to control vertical travel of the spindle within .005".
4. The clutch should be sufficiently sensitive to slip if the torque upon the tap or die increases more than two per cent.

The virtues of lead screw control are manifold. The lead screw positively determines the movement of the tool, and since the threads cut are bound to have the same pitch, angle, depth and lead as the controlling screw, it is impossible to cut a faulty thread. By the same token, it prevents "run away" of the tool in the metal. Because the tool is turning with the proper lead from above, varying or unequal pressure (such as that applied when tapping is done on a hand-operated drill press) cannot be applied.

One of the results is that tool life is greatly increased, as compared with a lathe operation, for example, in which the tool is always under positive pressure. One-inch taps, running under lead-screw control, have been known to tap 10,000 holes. From the production viewpoint, automatic lead screw operation acts as a pacemaker for the operator, and through virtually eliminating the human element in the feeding of work, makes it possible to estimate easily and accurately the time required for a given job.

A widely variable speed range is necessary to enable the machine to handle a wide range of work, with regard to both the type of material and the diameter of the threads being cut. For instance the recommended cutting speed for aluminum is 90 to 100 feet per minute, while the proper speed for manganese is only 10 to 18 fpm. To cut 100 fpm with a 2" tap requires a spindle speed of only 191 rpm, but to cut the same number of fpm with a ¼" tap requires a spindle speed of 1528 rpm.

Vertical travel of the spindle must be rigidly controlled in order to enable the operator to tap or thread up to a specified point in the work, without the danger of passing that point. Precise control of vertical travel, for example, prevents the tap from striking the bottom of a blind hole in which

Universal type machine taps forged steel turnbuckles. Two machines substituted for one double-spindle, manually operated machine, resulted in 300 per cent production increase. Lead screw at top can be reached easily, and changed in less than a minute.

Right:

Production on 12 special aircraft nuts ranges from 200 to 500 per hour.

Many pieces are heat-treated to 36 Rockwell C before tapping. Most are tapped to a Class 3 fit, and thread is required to run 90° to the face.

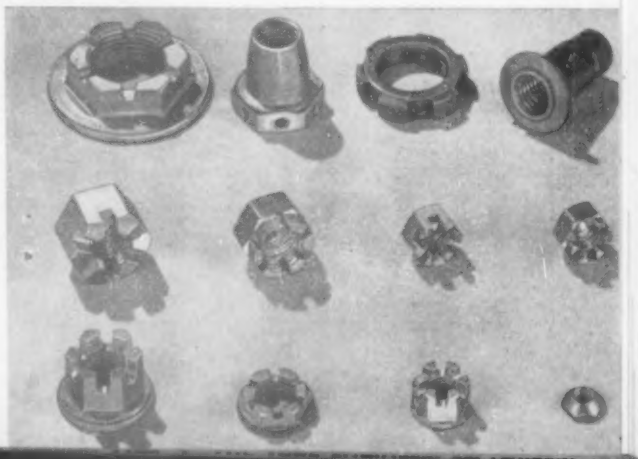


TABLE I.
Tapping Speeds for 26 Materials

MATERIAL	Tapping Speed Ft. per Min.
ALUMINUM	90 - 100
ALUMINUM—HARD	50 - 60
BAKELITE	50 - 60
BRASS	90 - 100
BRONZE (ALUMINUM 10%)	20 - 40
BRONZE-MANGANESE	30 - 40
BRONZE-PHOSPHOR	40 - 50
COPPER	80 - 100
CAST STEEL	20 - 30
CAST IRON	60 - 70
DIE CAST ALUMINUM	80 - 100
DIE CAST ZINC	55 - 65
DURALUMIN	80 - 100
FIBER	75 - 85
MALLEABLE CAST	35 - 55
MONEL METAL	20 - 25
STEELS	
CHROME-NICKEL	15 - 20
LOW CARBON	40 - 55
HIGH CARBON	20 - 40
MANGANESE	10 - 18
MANGANESE—1315	20 - 30
MOLYBDENUM	20 - 30
MOLYBDENUM—4615	25 - 35
STAINLESS	20 - 25
STAINLESS—12-14	15 - 20
STAINLESS—18-20	15 - 20

threads must be tapped to the bottom.

Clutch sensitivity is necessary to prevent tap breakage in cases where factors occur to greatly increase the torque upon the tap, such as forging flaws or unexpected blind holes. In tapping with properly equipped universal machines, tap breakage has been cut to a small percentage of its previous volume.

DETERMINATION OF SPEEDS

The commonest error of the average shop man using a universal tapping and threading machine is to run it too slow for best results. Because of his past experience with other types of machines in which the tool runs under pressure, and accuracy decreases as speed increases, he is afraid to step the speed up as high as he should.

It has been proved that there is a certain specific speed at which each tap works best on a given job. This speed cannot be exactly predicted, but it can be determined from experimenting with suggested tapping speeds, several of which are given with relation to different materials in Table 1. For instance, in a test it was discovered that a ¼" 20- pitch high-speed tap ran best on a universal machine in high carbon steel at 483 rpm. At any lower speed, the tap tended to rub the metal too much, and on the way out the heel of the tap had a tendency to tear the metal; at any higher speed, the tap tore the metal constantly, making imperfect threads.

As the length of the thread to be cut increases, the spindle speeds should be decreased in direct proportion, in order to minimize generation of heat.

Table II shows spindle speeds necessary to attain the cutting speeds in fpm shown in Table 1. It should be pointed out, however, that these may not be correct for any given job, due to the wide variety of conditions which may exist. For instance, the actual analyses of two pieces of steel supposedly having the same carbon content may vary to such a degree that one piece could be tapped at a normal rate of speed and another would have to be tapped very slowly.

Spindle speeds for tap diameters not given in Table II may be obtained by determining the proper cutting speed in fpm for the material being worked, transposing that speed into inches, and dividing it by the circumference of the tap which is to be used.

For instance, the cutting speed for aluminum is 100 fpm, or 1200 inches. The circumference of a 1" tap is 3.1416", and 1200 divided by 3.1416 equals approximately 382 rpm (see Table II). This formula can be used for any tap diameter if the proper cutting speed in fpm is known.

As mentioned earlier, with a lead screw tapping machine it is quite simple to determine production rates. To learn how many pieces can be tapped in one hour, first determine the tap rpm. Next find the distance which the tap is to travel through the work, and back it up far enough to allow removal of the workpiece.

If this distance is 1" and the thread pitch is 20, the distance represents 20 revolutions of the spindle in each direction (tap going in and coming out) or a total of 40 revolutions of the spindle. If tap speed is 200 rpm, divide 40 into 200, giving 5 pieces per minute or 300 pieces per hour. This represents 100 per cent efficiency, which of course would be rare in actual operation. Table III shows how many pieces can be tapped per hour at various unit speeds, with both 100 per cent and 80 per cent efficiency.

TABLE II.
Spindle Speeds Related to Cutting Speeds

Feet per Min.	30'	40'	50'	60'	70'	80'	90'	100'
Tap Dia.	REVOLUTIONS PER MINUTE							
1/16	1833	2445	3056	3667	4278	4889	5500	6111
1/8	917	1222	1528	1833	2139	2445	2750	3056
3/16	611	815	1019	1222	1426	1630	1833	2037
1/4	458	611	764	917	1070	1222	1375	1528
5/16	367	489	611	733	856	978	1100	1222
3/8	306	407	509	611	713	815	917	1019
7/16	262	349	437	524	611	698	786	873
1/2	229	306	382	458	535	611	688	764
5/8	183	244	306	367	428	489	550	611
3/4	153	203	255	306	357	407	458	509
7/8	131	175	218	262	306	349	393	436
1	115	153	191	229	267	306	344	382
1-1/8	102	136	170	204	238	272	306	340
1-1/4	92	122	153	183	214	244	275	306
1-3/8	83	111	139	167	194	222	250	278
1-1/2	76	102	127	153	178	204	229	255
1-5/8	70	94	117	141	165	188	212	235
1-3/4	65	87	109	131	153	175	196	218
1-7/8	61	81	102	122	143	163	183	204
2	57	76	95	115	134	153	172	191

TABLE III.
Hourly Production Rates

Sec. per piece	Pieces per hour 100% efficiency	Pieces per hour 80% efficiency
6	600	480
7	514	412
8	450	360
9	400	320
10	360	280
11	327	261
12	300	240
13	276	220
14	257	205
15	240	192
16	225	180
17	212	169
18	200	160
19	189	151
20	180	144
30	120	96
40	90	72
50	72	58
60	60	48
90	40	32
120	30	24
150	24	19
180	20	16

BASIC THREAD DIMENSIONS AND TAP DRILL SIZES

Table IV was prepared to give a selection of drill sizes according to the per cent thread desired.

Tests have shown that although a full depth or 100 per cent thread is only five per cent stronger than a 75 per cent thread—the former requires three times more power to tap than the latter. This of course puts a greater strain on the tap, and shorter tap life will result.

Wherever possible, therefore, care should be exercised to see that a drill size is chosen as near to the 75 per cent thread as possible, to obtain maximum tap life. Only drills listed as standard are shown.

Formula for obtaining drill size necessary to produce a required per

TABLE IV. TAP DRILL SIZES RELATED TO PER CENT OF THREAD DESIRED

Nominal Size	Basic Outside Diameter	Basic Root Diameter	Double Depth Nat'l. Thread	TAP DRILL Size	TAP DRILL Decimal Equiv.	% of Full Thread
1/4-20	.2500	.1850	.0650	7	.2010	76
				8	.1990	79
				5m/m	.1968	82
1/4-24	.2500	.1959	.0541	4	.2090	76
				5	.2055	82
1/4-28	.2500	.2036	.0464	5.5m/m	.2165	72
				3	.2130	80
5/16-18	.3125	.2403	.0722	G	.2610	71
				F	.2570	77
				1/4	.2500	87
5/16-24	.3125	.2584	.0541	I	.2720	75
				17/64	.2656	87
5/16-32	.3125	.2719	.0406	7.25m/m	.2854	67
				9/32	.2812	78
				J	.2770	87
3/8-16	.3750	.2938	.0812	5/16	.3125	77
				N	.3020	90
3/8-24	.3750	.3209	.0541	8.5m/m	.3346	75
				Q	.3320	79
				8.4m/m	.3307	82
7/16-14	.4375	.3447	.0928	U	.3680	76
				T	.3580	86
7/16-20	.4375	.3726	.0649	25/64	.3906	72
				W	.3860	79
				9.7m/m	.3819	85
1/2-13	.5000	.4001	.0999	27/64	.4219	78
				Z	.4130	87
1/2-20	.5000	.4351	.0649	29/64	.4531	72
				11.25m/m	.4429	88
9/16-12	.5625	.4543	.1082	31/64	.4844	71
				15/32	.4687	87
9/16-18	.5625	.4903	.0722	1/2	.5000	87
5/8-11	.6250	.5069	.1181	35/64	.5468	66
				17/32	.5312	79
5/8-18	.6250	.5528	.0722	14.5m/m	.5709	75
				9/16	.5625	87
11/16-11	.6875	.5694	.1181	39/64	.6093	66
				19/32	.5937	79
11/16-16	.6875	.5063	.0812	5/8	.6250	77
3/4-10	.7500	.6200	.1300	21/32	.6562	72
				41/64	.6406	84
3/4-16	.7500	.6688	.0812	11/16	.6875	77
7/8-9	.8750	.7307	.1443	25/32	.7812	65
				49/64	.7656	76
				3/4	.7500	86
7/8-14	.8750	.7822	.0928	13/16	.8125	67
				20.5m/m	.8071	73
				51/64	.7968	84
1-8	1.0000	.8376	.1624	7/8	.8750	77
				55/64	.8593	87
1-14	1.0000	.9072	.0928	15/16	.9375	67
				59/64	.9218	84

cent thread is given below.

A=decimal equivalent of drill
B=basic outside diameter
C=per cent thread
D=double depth nat. form thread
A=B (C x D)

Example: To find the drill size to produce a 75 per cent thread for a ⅜—24 tapped hole:

A= .3750—(.75 x .0541)
= .3346 (8.5 mm drill)

Formula for determining the per cent thread obtained by using a given drill:

$$C = \frac{B - A}{D}$$

Example: To find the per cent thread produced on a ½—20 tapped hole by using a 29/64 drill:

$$C = \frac{.5000 - .4531}{.0649}$$

= .72, or 72 per cent thread.

CHOICE OF LUBRICANTS

Though no single cutting fluid can be used successfully on every tapping or threading operation, there have been many cases where this has been tried, either through ignorance or carelessness. Actually, the proper choice of lubricants is highly important, resulting in longer tool life, less regrinding, better threads, higher production, and more efficient chip removal.

Almost as important is the method of applying lubricant to the work. Best results are obtained by forcing fluid into the hole under pressure, the amount of pressure being largely dependent upon conditions of the job, such as the tapping speed and the depth of the hole. When possible, fluid should enter the hole parallel to axis of the tap, and when this is not feasible, it should be introduced at the slightest possible angle. This will tend to prevent the tap from running dry, and will facilitate chip removal.

Many plant men have discovered that threads are held to perfect size in the morning, but by mid-afternoon are running considerably oversize. This may occur when the cutting fluid reservoir is small enough to permit work friction to heat the entire volume of fluid, thinning the lubricant and changing the thickness of film between tool and work. A sufficiently large reservoir should be used to prevent this occurrence.

Lubricants should always be kept at room temperature or slightly higher, especially if high speed taps are being used. High speed steel cuts most efficiently when warm, and if the lubricant is at the proper temperature, the ideal cutting condition will be reached more quickly. High speed steel is very brittle when cold, and the ill effects of using it at low temperatures may be seen when starting to use a high-speed tool early in the morning, in a shop which has been allowed to grow cold during the night.

In replacing dirty fluids with clean ones, it is highly important not only to drain the tank thoroughly, but to flush out the tank and piping, and clean the machine. If this is not done, dirt and grit will contaminate the fresh fluid and reduce its efficiency.

That sulphated oils are good for the tapping of steel is common knowledge, but few production men know the reason for this. When the old time blacksmith bought coal for his

forge, he was careful to avoid fuel with a sulphur content. Such coal caused sulphur, in gaseous form, to surround the work in the forge, making it impossible to weld two pieces of iron together. For this very reason, sulphated oil is best for cutting steel, forming a strong film between the tool and the work.

Sometimes the film strength is so great that it will fail to penetrate between the two, and will wipe away. Thus it will have to be diluted as much as 50 per cent with light paraffin oil to keep a constant film on the work. The degree of dilution necessary will vary somewhat with the precision of the tool being used, just as in a new automobile motor it is necessary to use a No. 10 oil because of the tight fit of the various parts. No. 30 oil would be too heavy to provide adequate lubrication.

An unusual recent discovery is that the best lubricant for copper, which tears very easily, is skimmed milk. In the past, lard oil, buttermilk, and paraffin have been used, but none of these lubricates as efficiently as skim milk. Sulphated oil cannot be used because it discolors the metal.

Since machinability is affected by a number of factors, the recommendation of lubricants in Table V is intended only to guide the reader in determining the most efficient compounds for particular jobs. It often becomes necessary to experiment with coolants when tapping or threading, sometimes decreasing, sometimes increasing the percentages of two different oils to obtain a satisfactory thread.

TABLE V.
LUBRICANTS SUGGESTED FOR TAPPING AND THREADING

Aluminum	Kerosene and Paraffin—50-50
Aluminum—Hard	Kerosene or Turpentine
Bakelite	Dry
Brass	Soluble
Bronze-Manganese	Paraffin or Soluble
Bronze-Phosphor	Sulphur Base Oil or Soluble
Cast Iron	Soluble or Dry
Cast Steel	Sulphur Base Oil
Copper	Skim Milk
Die Cast Aluminum	Kerosene and Paraffin Oil
Die Cast Zinc	Kerosene and Paraffin Oil
Duralumin	Kerosene and Paraffin Oil
Fiber	Dry
Malleable Iron	Soluble
STEELS	
Chrome-Nickel	Sulphur Base Oil
Low Carbon	Sulphur Base Oil
High Carbon	Sulphur Base Oil
Manganese	Sulphur Base Oil
Molybdenum	Sulphur Base Oil
Stainless	Sulphur Base Oil
Monel Metal	Sulphur Base Oil

PREPARING HOLES FOR TAPPING

In many plants, the common inclination is to drill the holes and then start thinking about tapping them. In some cases, tapping seems to have been regarded as a method of correcting the results of poor drilling. Nothing could be farther from the truth. All drilling of holes which are to be tapped with high quality threads, particularly at production speeds, should be done with the greatest care, carefully maintaining size throughout each job.

There are two general types of holes, open and blind. If depth of metal and other considerations permit, blind holes should be drilled deep enough so that use of a bottoming tap, to cut full threads to the very bottom of the hole, is not necessary. If threads must be cut to the bottom, however, the highly precise depth control of the modern universal tapping and threading machine makes it possible to tap such holes at high speed. In tapping any blind hole, always be sure to clean out the drill chips. If left in the hole, they will load the tap, prevent it from cutting to the proper depth, and may cause rough, imperfect threads.

Tapping difficulties are often encountered in tapered pipe thread holes. In this type of work, all the teeth of the tapered tap are cutting, while a straight thread tap cuts only with the first full thread and the chamfered portion, with the rest of the threads acting as a follower. The tapered tap carries a steadily increasing load as it advances. Ten years ago, this type of tapping resulted in many broken taps, caused by the increasing torque. On a modern universal machine, the result will be frequent slipping of the clutch and slowing of production if the holes are not properly prepared.

Copper, drawn aluminum, monel metal, silver, nickel, and other extremely malleable metals have a tendency to flow toward the crest of the minor diameter when being tapped, and for this reason the minor diameter will be smaller after the tapping operation. This condition should be considered when deciding upon the tap drill sizes for work involving these metals.

Another headache in the tapping department is the tapping of holes punched in thin sheet metals. Loading occurs on this type of job because the tap, when it reverses, tends to pull in the flared metal on the underside of the sheet. As the load increases, the results will be the same as those experienced in tapping the soft, stringy metals. The larger the hole punched in sheet metal, the less tendency for the tap to load.

It is highly advisable to check carefully the size of cored holes in castings and forged holes in forgings before tapping. If they are smaller than necessary to produce a 75 per cent thread depth they should be reamed.

Although all of these precautions should be taken for perfect tapping results, the universal type of machine has eliminated much of the danger of tool breakage, production slowdown and high reject percentage, resulting from careless or irresponsible personnel.

One advantage of the universal lead screw tapping machine is that it will tap Class 3 threads on a production basis with commercial ground taps, which are considerably less expensive and are much easier to obtain than precision ground taps. However, in using a commercial ground tap for this degree of accuracy, care should be taken in grinding not to provide too much clearance.

Much difficulty in tapping is the result of failure to center the hole in the work with the tap. To do this properly, the setup man should attach a dial indicator to the tap and indicate the hole so that its axis and that of the tap are absolutely in line. It should be remembered that the difference between a "go" and a "not go" gage is sometimes not more than .0005", and if the hole is not in line with the tap, the tap will very likely enlarge the hole enough to cause rejection if inspection standards are strict. Whenever possible it is advisable to use taps with an odd number of flutes because they increase concentricity and hold to size.

THE END

JULY DATA SHEET CREDIT

The author of the highly practical and broadly applicable Production Data Sheet published in *The Tool Engineer* for July certainly merits credit for his contribution.

"Economical Lot Sizes" was prepared for The Bramson Publishing Company by Louis G. Blumenbaum of the American Watch Case Company.

When Production Levels Hang by a Thread

Battery of Warner & Swasey No. 11 Precision Tapping and Threading Machines, and (below) a No. 12 in the Dayton plant of United Aircraft Products, Inc.

THE United Aircraft Products Company, Dayton, Ohio, with plants in California and Ohio, was one of the very first to use Warner & Swasey Precision Tapping and Threading Machines. Its production is almost exclusively aircraft parts held to strict specifications of the U. S. Army Air Corps. Tapping operations on hundreds of aircraft parts call for Class 3 thread fits, with tap depth held to within ½ thread.

Such precision work on a production basis presented problems that have been completely solved by the new design and many improved features of Warner & Swasey Precision Tapping and Threading Machines. The new principle of lead screw with electrically actuated guide fingers to control tap travel practically eliminated thread inaccuracy. A safety clutch which releases in split second time should tap hit a hard spot or a jammed chip, saves spoiled threads and tap breakage. A dial gage set by the operator accurately controls tapping cut to determined depth.

WARNER & SWASEY *Precision*
TAPPING AND THREADING MACHINES
4 Models
Capacities 0-80 to 1½" in steels —to 2½" in soft metals and plastics.

Ask your Warner & Swasey representative to explain the revolutionary improvements—or write for catalog.

WARNER & SWASEY Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES

Faster Production OF MOLDS AND DIES

on the MONARCH SHAPEMASTER

You can turn one or any quantity of mechanically perfect molds, dies, punches or similar shapes on a MONARCH SHAPEMASTER from four to five times faster than by other methods.

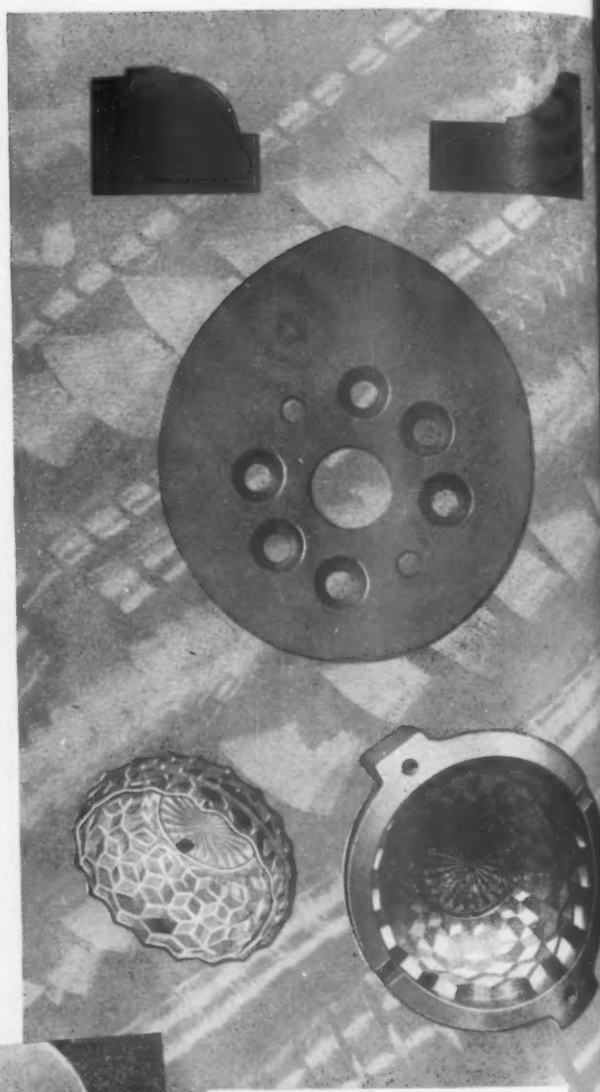
One master cam will reproduce literally thousands of different round, oval or other shapes on the outside, inside or face of the work. With Monarch-Keller electric controls and a thin metal template you can turn the most intricate contours with precision and speed.

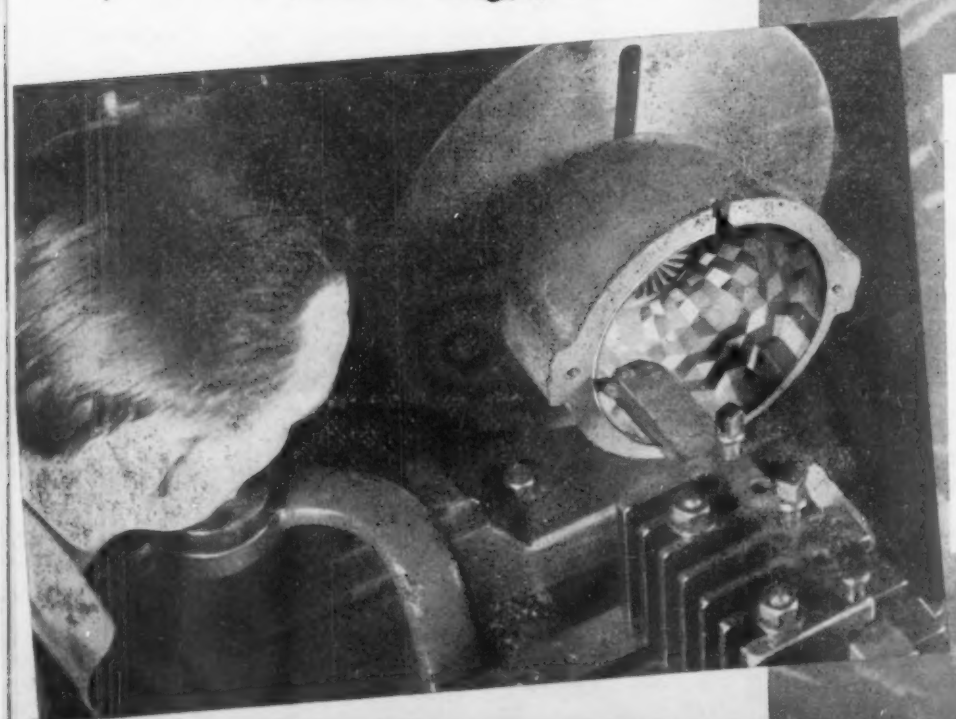
We cannot equip your present lathes with Monarch-Kelly attachments, because they must be built in at the factory. However, we can demonstrate on actual work the value of this equipment . . . and we'll gladly study test samples or blueprints to determine the utility of MONARCH SHAPEMASTERS for your tough jobs. We can make fairly prompt deliveries for War production. An inquiry to Sidney, Ohio, or to one of our convenient field offices will bring fast action.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

Direct factory branches at Chicago • Cleveland • Detroit
Newark • Pittsburgh • Representatives in principal cities.

MONARCH LATHES *Save Time*



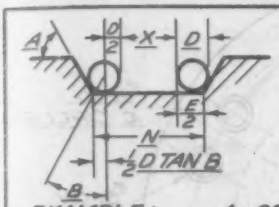


This MONARCH SHAPEMASTER is producing the shape and contour from a master cam and a thin metal template. You can produce one unit or any number in less time and at lower cost with this machine. This Monarch development was made before the war, and accepted by industry, but production was discontinued to meet demands for our standard lathes for the War program. Now, it is again part of the Monarch line.

PRODUCTION DATA SHEET

Simplified Pin Measurements for Gibs and Dovetails

•Complete on this page is a tested standard, copyrighted by Larry H. George. The formulas are simple enough to eliminate any need for explanation. However, examples are furnished for each case. In all instances, everything is known except the value for X. The pin diameter sizes are standard, and are widely used by American toolmakers. Constants E, F and G are given with the respective pin diameters for three common angles in the chart; for angles other than 45°, 50° and 60°, adapt the respective formulas for E, F and G, according to the particular case.

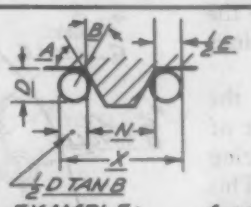


CASE No. 1
THE GIB SLIDE

$E = D(1 + \tan B)$

$X = N - E$

EXAMPLE: $A = 60°$; $B = 30°$; $D = \frac{3}{8}$ IN.; $N = 1\frac{1}{2}$ IN.
$E = \frac{3}{8}(1 + .59151)$; $X = 1.5 - .59669$ OR $X = .90331$ IN.

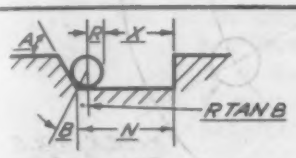


CASE No. 2
THE GIB

$E = D(1 + \tan B)$

$X = N + E$

EXAMPLE: $A = 45°$; $B = 22\frac{1}{2}°$; $D = \frac{1}{4}$ IN.; $N = 2\frac{1}{8}$ IN.
$E = .25 \times 1.4142$; $X = 2.125 + .35355$ OR $X = 2.47855$ IN.

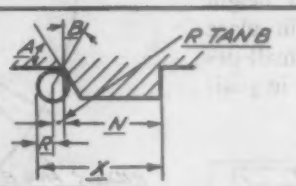


CASE No. 3
THE HALF GIB SLIDE

$F = R(1 + \tan B)$

$X = N - F$

EXAMPLE: $A = 50°$; $B = 25°$; $D = \frac{5}{16}$ IN.; $N = 3\frac{1}{2}$ IN.
$R = .15625$; $F = .15625 \times 1.46631$
$X = 3.500 - .0729$ OR 3.4271 IN.

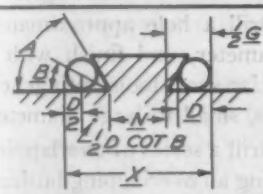


CASE No. 4
THE HALF GIB

$F = R(1 + \tan B)$

$X = N + F$

EXAMPLE: $A = 55°$; $B = 27\frac{1}{2}°$; $D = \frac{3}{16}$ IN.; $N = 2\frac{3}{8}$ IN.
$R = .09375$; $F = .09375 \times 1.52057$
$X = 2.750 + .14255$ OR 2.89255 IN.

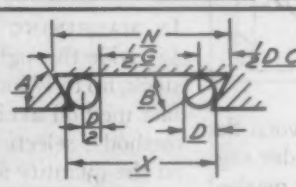


CASE No. 5
THE DOVETAIL

$G = D(1 + \cot B)$

$X = N + G$

EXAMPLE: $A = 70°$; $B = 35°$; $D = \frac{3}{4}$ IN.; $N = 7\frac{1}{2}$ IN.
$G = .75 \times 2.4281$ OR 1.82211
$X = 7.5 + 1.82211$ OR 9.32211 IN.



CASE No. 6
THE DOVETAIL SLIDE

$G = D(1 + \cot B)$

$X = N - G$

EXAMPLE: $A = 58°$; $B = 39°$; $D = \frac{5}{8}$ IN.; $N = 4\frac{3}{8}$ IN.
$G = .625 \times 2.2349$ OR 1.39681
$X = 4.375 + 1.39681$ OR 5.77181 IN.

NOTE: ∠A, D, & N ARE KNOWN IN ALL CASES. $\frac{1}{2}B = \frac{1}{2}$ ∠A; R = ½ DIA. OF PIN. WANTED: B & X IN ALL CASES.

CONSTANTS FOR CALCULATING ABOVE CASES OF COMMON ANGLES OVER STANDARD PINS

Std. Pin Dia. Fract'n	Decim.	E A=45°	E 50°	E 60°	F A=45°	F 50°	F 60°	G A=45°	G 50°	G 60°
3/64	.04688	.06629	.06873	.07381	.03315	.03436	.03690	.16004	.14740	.12806
1/16	.0625	.08839	.09164	.09858	.04419	.04582	.04929	.21339	.19653	.17075
5/64	.07813	.11048	.11453	.12324	.05524	.05726	.06162	.26673	.24566	.21344
3/32	.09375	.13258	.13747	.14763	.06629	.06873	.07381	.32082	.29480	.25612
1/8	.125	.17678	.18329	.19717	.08839	.09164	.09858	.42677	.39306	.34150
5/32	.15625	.22097	.22661	.24646	.11048	.11453	.12324	.53347	.49133	.42688
3/16	.1875	.26516	.27493	.29525	.1325	.13747	.14763	.64016	.58959	.51224
1/4	.250	.35355	.36658	.39434	.17678	.18329	.19717	.85355	.78612	.68301
5/15	.3125	.44194	.45322	.49292	.22097	.22061	.24646	1.06604	.98266	.85376
3/8	.375	.53033	.54987	.59151	.26516	.27493	.29525	1.28003	1.17919	1.02451
7/16	.4375	.61872	.64151	.69009	.30936	.32075	.34504	1.49218	1.37572	1.19527
1/2	.500	.70710	.73315	.78867	.35355	.36658	.39434	1.70710	1.57225	1.36602
5/8	.625	.88388	.91644	.98584	.44194	.45322	.49792	2.13388	1.96532	1.70753
3/4	.750	1.06066	1.09973	1.18301	.53033	.54987	.59151	2.56066	2.35838	2.04903
1	1.000	1.41421	1.46631	1.57735	.70710	.73315	.78867	3.41421	3.14451	2.73205
1-1/2	1.500	2.12131	2.19946	2.36602	1.06066	1.09973	1.18302	5.12131	4.71676	4.09807
2	2.000	2.82842	2.93262	3.15470	1.41421	1.46631	1.57735	6.82842	6.28902	5.46410

NOTE: This is the thirty-fifth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

THE CRIB

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

IDEAS · KINKS · SHORT CUTS

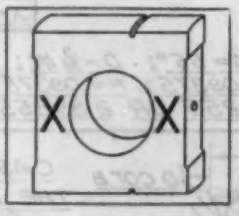
Grease Holds Parts In Position

IN ASSEMBLING a die or fixture having coiled springs seated in inverted counterbored holes sometimes it is difficult to assemble the other parts without the springs falling out.

A solution is provided by the application of a small amount of grease on the end of the spring before inserting it in the hole. This will prevent it from dropping out.

Another use for grease is to hold the small jib on a vernier height gage scriber attachment in place while changing work. A small deposit of grease will hold it in position indefinitely.

Increase Size of Flat Plug Gages

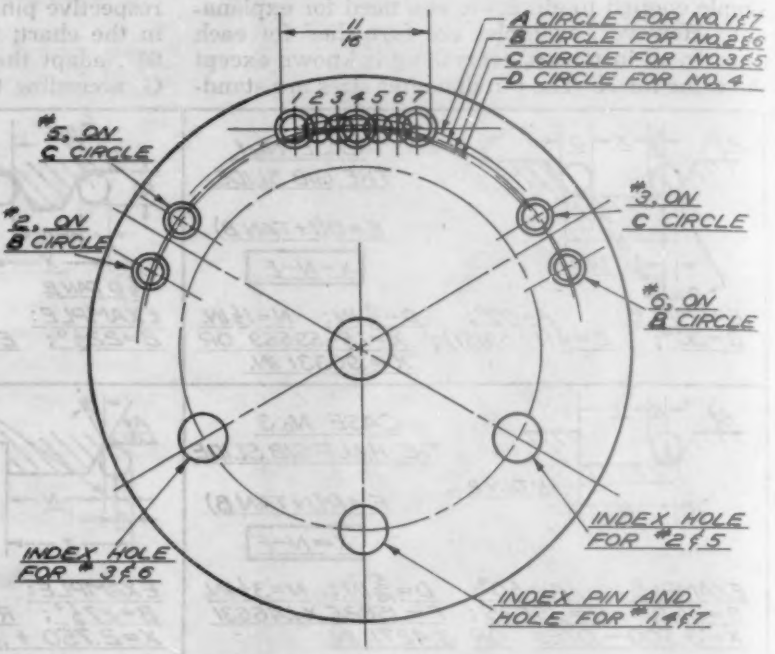


TO INCREASE the size of worn flat plug gages, a Canadian reader suggests hammering at points marked "X" on the drawing. Gages are then to be ground down to size.

The material is machine steel, pack hardened. Though an occasional gage chips, excellent general results are reported.

If necessary, points "X" may be torch heated to draw the surface. Hammering also makes necessary the taking of a light cut off the flat faces at times.

Machining Small Slots; Three Recommended Methods


11/16
A CIRCLE FOR NO. 1 & 7
B CIRCLE FOR NO. 2 & 6
C CIRCLE FOR NO. 3 & 5
D CIRCLE FOR NO. 4
1 2 3 4 5 6 7
#5, ON C CIRCLE
#2, ON B CIRCLE
#3, ON C CIRCLE
#6, ON B CIRCLE
INDEX HOLE FOR #2 & 5
INDEX HOLE FOR #3 & 6
INDEX PIN AND HOLE FOR #1 & 7

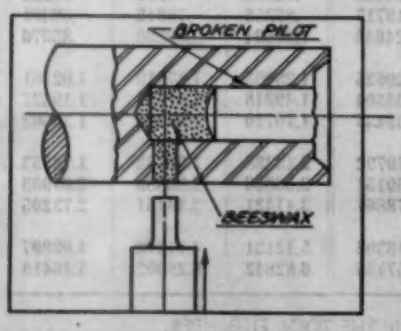
IN MACHINING SLOTS as small as ⅛" wide through ¾" round or bar stock, up to 1" long, there is no truly fast method available. Of possible methods, selection depends largely on the quantity and desired rate of production, as well as on equipment on hand. Following are three methods.

(1) Fishtail milling of ⅛" diameter in an opposed spline or slot—miller, requires no starting hole such as is necessary for end mills. Time of operation is approximately halved. One spindle kicks back ahead of the other, to avoid cutter contact.

(2) Drill a hole approximately .120" diameter, and finish with a slotter. Use short tools with generous fillets, small to large diameter.

(3) Drill a series of overlapping holes, using an overlapping bushing plate as per sketch. Then mill, slot, nibble or broach slot, there being little stock to remove. This is the next quickest to method 1. Holder should be made to encompass work. A vise can be used for anything but broaching. A broach can be made for trial by using a flat file to nearest dimensions, and pressing through an arbor press.

Removing Pilot Pin From Blind Hole



WHEN A PILOT PIN breaks in a blind hole, removal often causes considerable trouble and expense.

Such a case occurring in an expensixe fixture, with the break below the surface, was solved by the following inexpensive method.

An air vent of ⅛" diameter offered an opportunity to remove the broken pin "hydraulically".

A small plunger pin was made to fit the ⅛" hole. After filling the vent hole with ordinary beeswax, the plunger pin was inserted and employed as a ram. A bench vise was utilized for power.

After two or three applications of wax and ram, the broken pin started to move, and in a few minutes it was easily removed.

● Send your time-and-material-saving ideas to The Bramson Publishing Company, 2342 W. Grand Boulevard, Detroit 2, Mich. Five dollars are paid for each idea published.

What About Standards in Postwar?

STANDARDS are important in the war effort, but their postwar importance promises to be far greater. By "standards" we mean accurately defined processes, sizes, qualities and tests of materials and equipment that have been generally agreed upon by makers, users, and the public as proper and desirable for general use. A standard may be brief, only a sentence or a paragraph, while again it may be a long and highly technical document. Standards have four distinct values:

- First, **they educate.** They set forth ideals, or qualify goals for the guidance of manufacturers and users alike. They are invaluable to the manufacturer who wishes to enter a new field, and to the purchaser of a new product.
- Second, **they simplify.** They reduce the number of sizes, the variety of processes, the amount of stock, and the paper work that largely account for the overhead costs of making and selling.
- Third, **they conserve.** They save the losses of defects, left-over pieces, and inadequate tooling that must accompany off-lot manufacture, by allowing large-scale production of standard designs. Each step in this direction justifies better tooling, more careful design, and more precise controls.
- Fourth, **they certify quality** for the advertiser who points to proven values, and to the buyer who sees the accredited trade mark, nameplate or label.

Thus, standards are truly the basis of the American system of providing more goods for more people at lower cost.

THE DEVELOPMENT OF STANDARDS

IT IS IMPORTANT that standards should not be mandatory, nor deter development of new designs. They should be considered as norms, to which sensible people will conform because they are clearly good and economic. Emphasis should be placed on preferred sizes of items, giving logical gradations of capacity. No upper limit whatever should be placed on the strength of a standard size of bolt, or on the durability of a standard bucket, or the horsepower of a standard motor frame, even though normal values may be recognized.

The development of a standard requires unanimous agreement of a committee, representing manufacturers, users, and the public. Disagreement should be resolved by getting and considering more facts. It is much easier to reach agreement, however, if standards are recognized for their educational value, and as marking acceptable quality levels, rather than as mandates. By publishing standards in proposed or trial form, attainment of lasting and satisfactory standards is often expedited.

THINK OF STANDARDS IN RECONVERSION

That more attention is not paid standardization may be caused by belief that progress has been sufficient. Perhaps inattention derives from lack of consideration to how well they pay.

The article appearing on this page reviews the factors to which standards can pertain. It outlines the benefits to be expected. Reading it should make the production engineer more critical of his prewar attitude and more conscious of where he can beneficially increase the application of standards in postwar.

This material is condensed from an article, "What Role for Standards in Postwar Production?" from "Industrial Standardization", December, 1943, written by L. F. Adams and P. L. Alger.

Standards that have a good basic reason for their use are adopted without question. In the industrial field standards have been accepted, not only for manufacturing but also for purchasing, because every manufacturer is a large purchaser of materials he does not make.

Standards are accepted because they pay good dividends in increased production, better quality, and decreased cost.

THE TREND OF STANDARDIZATION

MECHANIZED WAR has multiplied many fold the problems of interchangeable parts and has shown the value of standardizing materials, processes, and finishes, as well as dimensions. Decentralized manufacture has brought forcibly to our attention the advantages, even the necessity, of better standards. If more standards had been ready, the effort we expended in war conversion would have been to this extent available for new developments.

●

The trend of progress set in motion by our war experience, suggests that we develop:

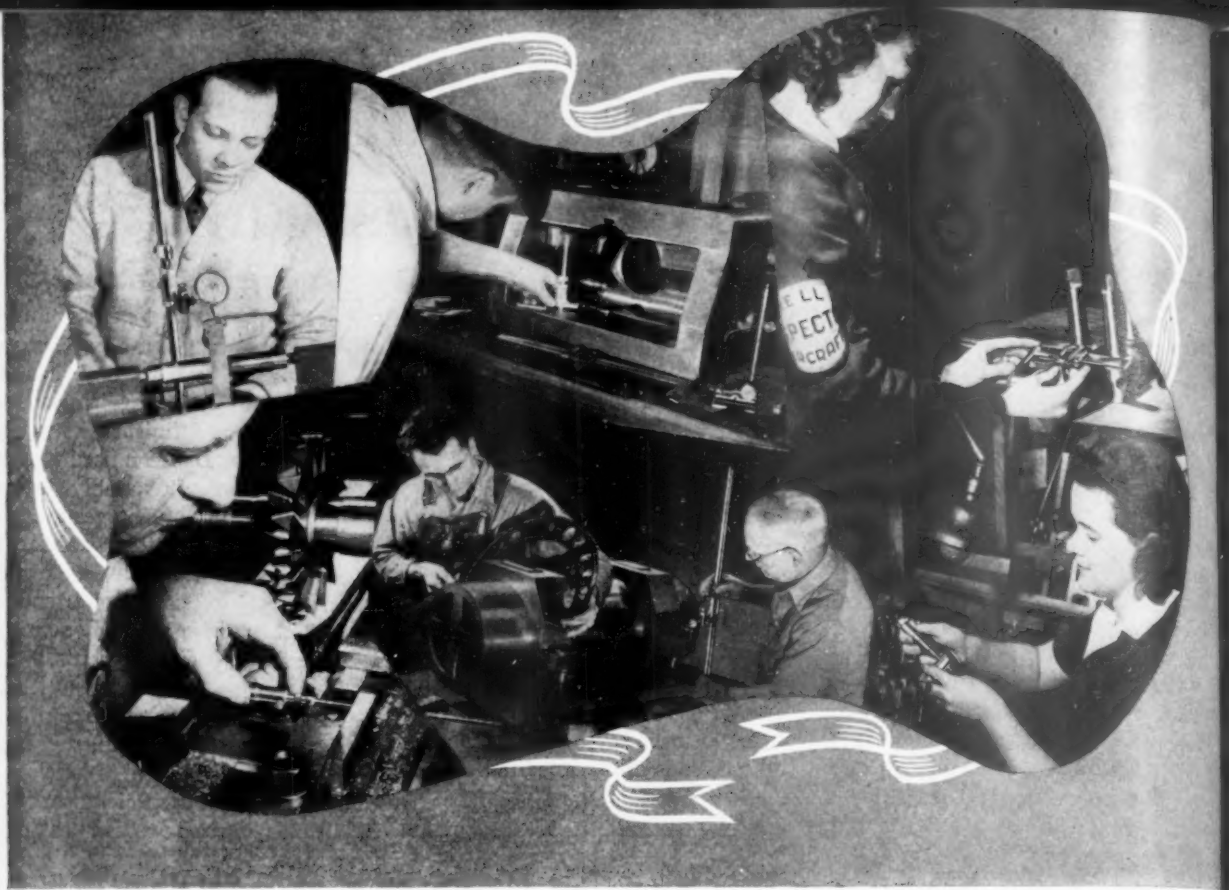
1. Improved specifications, establishing desired attributes of each product, without restricting manufacturing methods.
2. Improved standards for basic materials, so that properties may be more completely defined and more closely maintained.
3. Improved standards of size, providing preferred number steps of dimensions; reducing kinds of one product that must be produced and stocked.
4. Improved standards for production processes, including tolerance requirements; to aid the producer of specialized parts, and facilitate decentralized manufacturing.
5. Improved standards for testing, so that all the attributes of a product may be measured, thus leading to improved control of quality.
6. Improved methods of accrediting, packing, and shipping; so that products may be more widely distributed. Thus American quality products may aid abroad as well as at home in raising standards of living.

SHALL WE GO FORWARD?

AT PRESENT and during the war, standardization is in demand. Hundreds are working on American Standards. In 25 years about 600 American Standards, mostly industrial, have been issued. There should be five or ten times as many. Thousands of men are willing to cooperate and merge their ideas and experience.

THE END

STARRETT TOOLS



A Tribute
from MAKERS *to* USERS *of*
STARRETT TOOLS

Without your alert mechanical minds to plan and organize their work—

Without your skilled hands and keen eyes to make their work constantly effective—

Starrett Precision Measuring Tools could not have made the contribution to the cause of the United Nations for which we, their makers, have worked without stint. Our faith and confidence in your ability to make the most of Starrett Tools is what has kept us everlastingly at the job of turning them out in unprecedented quantities while maintaining Starrett standards of accuracy and dependability.

We knew you wouldn't let us down and we want you to know that the quality and quantity of precision work you have turned out has the sincere admiration and appreciation of those of us who have furnished the tools.

Keep up your fine work until the last gun is fired. We'll keep on doing *our* part of the job to the very limit of our ability.

Now, with Two Service Stars

THE L. S. STARRETT CO. • ATHOL • MASSACHUSETTS • U. S. A.
World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
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The Navy Looks at POSTWAR ORDNANCE

REAR ADMIRAL GEORGE F. HUSSEY, JR., USN
CHIEF OF THE BUREAU OF ORDNANCE, NAVY DEPARTMENT

Official U. S. Navy photos

Rear Admirals F. L. Reichmuth *(left, in uniform)*, and George F. Hussey, Jr., inspect 16-inch gun breech block.

Will war-built Navy plants and machine tools become a postwar surplus property problem?

DURING THREE YEARS at sea which intervened between a previous tour of duty at Washington, and my assumption of present duty, I kept more or less in touch with what was going on in the shore establishments in which I had previous interests.

I knew, of course, that the war had called for a tremendously increased effort on the part of all hands, but I was hardly prepared for what I met when I returned from sea service in May, 1942, to head the Production Division of the Bureau of Ordnance.

As a preliminary to taking over the new billet, my predecessor suggested that I take a turn around some of the plants that had been set up to handle our share of the war effort. I came back completely "open-mouthed."

I visited some of our Naval Ordnance plants—those built with government funds, and operated under a commanding officer by a contractor-operator. I saw commercial plants, too, which a year or so before had been turning out automobiles, ice boxes, washing machines, and a host of other items that went to make up the American standard of living, now wholly converted to war manufacture.

(Concluded on page 134)

In preparing this article expressly for the nation's production engineers, the Chief of Navy Ordnance based it on a speech which he delivered recently before the National Association of Manufacturers.
—THE EDITORS

Bramson photo

Representing widely divergent mass manufacturing industries, four outstanding Milwaukee production engineers participated in the fifth of the nation-wide series of PRODUCTION Round-Tables sponsored by The Bramson Publishing Company. *Seated, left to right:* E. G. Connors, Evinrude Motors; W. P. Schmitter, Falk Corporation; J. A. Riedl, Nash-Kelvinator Corporation; and J. Ernst, Allis-Chalmers Manufacturing Company. *Standing, left to right:* W. A. Scotten and J. S. Wilford, Associate Editors, *The Tool Engineer*.

Production Engineers Visualize Demand for Cost-Cutting Machines

PREDICTING that improved manufacturing techniques should eventually compensate for the higher labor costs anticipated when industry swings into competitive, peacetime output, four prominent production executives from the Milwaukee area discussed possible postwar trends in machine tool design and utilization in the latest PRODUCTION Round-Table.

Held July 27, in the Wisconsin city, the meeting was the fifth of a nation-wide series sponsored by The Bramson Publishing Company.

Answering a set of questions posed by the Editors of this publication, the mid-western engineers indicated newsworthy trends in equipment design requirements visualized for postwar in varied mass production industries.

The consensus of thinking, as revealed in an evening-long forum following a dinner at the Hotel Pfister, can be resolved into three salient conclusions:

1. War-time experience with new machines and new methods will permit production engineers eventually to compensate for much of the higher labor costs it is generally assumed industry will bear after the war.

2. Finer tolerances in metal-cutting and fabricating will be utilized at no added cost to improve the life and quality of consumer goods.

3. War production experience and changing conditions in industry will necessitate substantial revisions in the basic design of numerous machine tools.

AUTHORITIES IN VARIED FIELDS

Agreeing with the Editors that the opinions expressed should in no sense be construed as reflecting the policies of the companies they represent, the Round-Table participants were free to answer questions and offer opinions based on their personal judgment and experience gained in mass production metal-working. Consequently, the discussion was frank and sentiment on several topics was by no means unanimous.

Again indicative of the varied industrial backgrounds and personal production experience represented at previous PRODUCTION Round-Tables were the four conferees at Milwaukee. They were John Ernst, Works Manager, West Allis Tractor Division, Allis-Chalmers Manufacturing Company; Walter Schmitter, Chief Engineer, Falk Corporation; Julius A. Riedl, Master Mechanic, Seaman Body Plant, Nash-Kelvinator Corporation; and Edmund G. Connors, Assistant Factory Manager, Evinrude Motors.

Though they are now engaged largely in the production of war materiel, the four men represent industries normally producing widely divergent products. All are among the largest users of machine tools and production equipment in the area. Consequently, opinions offered by the participants should be evaluated in light of their managerial and production experience gained in the manufacture of tractors and farm implements, gears and gearing equipment, automobile bodies and parts, and

outboard motors.

Necessarily, numerous problems in war production were discussed at the meeting. Yet, all answers to technical questions posed were based on probable peacetime product requirements and industrial conditions contemplated in postwar competitive manufacture.

Capitalizing on the opportunities offered in this informal across-the-table discussion of mass production metal-cutting, the Editors posed the seven specific questions in their PRODUCTION POLL of the Metal-Working Industry. The "yes" and "no" answers received were incorporated into the percentages obtained in nation-wide samplings as reported on page 106 of this issue.

COMMENT AT THE ROUND-TABLE

More interesting were the subsequent explanations by each conferee for his "vote" on these subjects of vital importance to both users and producers of metal-cutting and fabricating equipment. These comments should add significance to the percentage figures reported, and, in light of the manufacturing background represented, should materially assist in an analysis of trends in thinking among such typically large users of production machines.

Confirming the nation-wide sentiment as revealed in the most recent PRODUCTION POLL, the Milwaukee engineers agreed unanimously that the postwar products of their companies would be manufactured with greater precision as a result of their war production experience.

Ernst, of Allis-Chalmers, pointed out that finer tolerances in postwar manufacture would be utilized wherever they could without adding to the product cost. War Production, he said, had revealed "ways and means of doing so without increasing costs."

How radically wartime experience may affect postwar conceptions of production tolerances was indicated in the observations of Riedl, of the Nash-Kelvinator automobile body division. Normally engaged in the mass production of one of the finest automobile bodies built. Riedl foresees a postwar inclination toward reduced fabricating limits in his organization as a result of its war job experience of machining intricate radial aircraft engine parts.

VIEWPOINT OF A GEAR MAKER

Schmitter, of Falk, who is recognized as one of the nation's gear producing experts, commented interestingly on postwar tolerances in his industry. "Starting out with the fundamental cutting process," he said, "I think the improvements of the last few years in the machines themselves will lead to greater accuracy in tooth spacing, and improvements in hobs will be responsible for better tooth forms.

"For instance," he continued, "several new designs in hobbing machines have been evolved during the war, and even where those improvements were merely in the nature of refinements, they are reflected in the product that comes off those machines.

"Even on something that was thought to contribute so little to the final result as change gears there has been much accomplished in redesign," Schmitter said. "There have been great improvements in both indexing and drive chains, in their mountings and in refinements in lubrication. The extension of the shaving process, as far as the product is concerned, is going to be reflected in substantially improved quality."

Obtaining greater precision, Schmitter indicated, is contingent on machine design. Stating that his concern has designed much of its new large equipment, it is well aware of how much better the newer machines are.

In answer to a question of what this producer sought in revised machine design, the Falk official said "primarily greater rigidity, ability to withstand greater feeds, and higher cutting speeds. Along with greater rigidity comes less vibration and more accuracy."

Specific improvements in gear producing equipment cited by Schmitter to produce a finer product, as well as lengthen the life of the machine itself, are better oil sealing and better lubrication, better spindle mounting, bearing mountings and gears.

Connors, of Evinrude, pointed to a result of wartime experience that may prove typical in mass production of consumer products. Peacetime builders of the finest outboard engine that competitive price conditions would permit, his concern will probably produce a postwar product embodying precision standards learned in war work that will materially improve wearability, and consequently sales appeal, without increasing production costs.

If all mass production industries find Defense Plant Corporation machinery as acceptable as the Milwaukee engineers indicated it would be, the Government's surplus machine tool problem would be greatly alleviated. The vote was 100 per cent for using such equipment in their plants after the war.

Interestingly enough, all of the men pointed out that war-built machines were vast improvements over many of the same type machines they were using before the war. How much market for postwar-built units will develop, it could be surmised, will depend largely upon the improvements in design machine tool builders will offer.

In answering the question as to whether machine tools have kept pace with cutting tools, the vote was 50-50. Explanation of the variance between this vote and that of 67 per cent against machine tools in the nation-wide PRODUCTION POLL may lie in the current production experience of this mid-western group.

Can the present arrangement of machine controls be changed to provide greater motion economy on the part of the operator? The conferees voted three to one that improvements could be made.

In discussing this question, Connors mentioned the equally important subject of table height. Recalling a conversation with a large milling machine producer, Connors said they agreed on the "almost extraordinary fact that machine table levels are much lower than they should be for high speed working machines."

Stating that work benches were originally designed low to accommodate vise work, he pointed out that today most bench operations are not vise work, but assembly work. "When a man stands up at any operation on such a bench or machine today as he normally does in high speed production," the Evinrude engineer said, "he is always bending over or reaching low. His work is far from his eyes. This is a fatigue condition.

"This brings up the question of handling time," he continued. "Machines today move so quickly that if you make a timestudy you will find on small parts that machining time is far less than handling time unless you are very careful."

The question of electronic controls resulted in a favorable three to one vote, but with the same reservations advanced at previous Round-Tables. Lack of knowledge of the range of applicability and fear of involved maintenance problems tempered enthusiasm for electronic controls. Agreement was general that production men will not be satisfied indefinitely with compromises in speed control, and this situation bids fair for the electronic variable speed drives.

These men are, however, interested in variable speeds regardless of how they are obtained—electronic, hydraulic or adhesion.

Three of the men declared that the lubrication systems on their machines are neither adequate nor sufficiently accessible.

Especially significant is the fact that all of the conferees except Schmitter, a producer of gears, believe that precision forming, forging, and the like, eventually will substantially reduce the amount of stock removal now necessary in their production.

Seeking other newsworthy trends in mass production metal-cutting, the Editors posed another set of questions at the Milwaukee Round-Table. While certain answers substantiated the opinions of prominent production men re-

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What trends in metal-working do production engineers foresee? Standardization of parts and lubricant requirements, increased power and rigidity, are machine tool design demands revealed at the Milwaukee meeting

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vealed at earlier meetings in this series, new indicators of postwar thinking were also expressed.

Here is the consensus of answers to some of these questions, offered at the Milwaukee Round-Table:

● 1. What effect will labor rates have on the selection of equipment in your plants after the war?

Discussion of this question resolved itself into the economics of mass production, with all participants agreeing that regardless of labor rates, the production engineer's problem always will be one of shaving the cost per piece.

In sharp contrast with the opinion of several previous Round-Table participants, Ernst said that postwar labor rates "wouldn't have any bearing on our selection of equipment because we are always looking for the most economical producing equipment that can be had in line with our quantity of production."

PIECE-COST IS IMPORTANT FACTOR

Stating that he based his costs on machine production rather than on labor production, Ernst said his postwar interest in special machines would depend entirely upon whether such equipment would pay for itself in the over-all picture as compared with conventional machines.

One problem cited by Ernst was the lack of flexibility in special purpose machines. Consequently, he said, he converts "existing machinery where it is practical and is as economical as purchasing new machines."

His problem is complicated, he said, by the fact that much of his work is neither at the high-production rate of automobile manufacture or at the job shop pace. Because he must produce at the same piece cost as is expected from mass production, his prime requirement in machines is versatility. Among the solutions to this problem, he believes, is the further development of interchangeable heads.

Schmitter credited machine tool builders with resourcefulness in this regard. "I can think of instances where we have had to ask a manufacturer for greater flexibility in his standard equipment," he said. "In most instances, he has been able to provide us with what we wanted."

MAN-HOURS MUST BE REDUCED

Further discussion, however, pointed up the difference in machine requirements in Allis-Chalmers and Falk Shops.

Connors looks for continuing acceptability of any new equipment that will permit a manufacturer to reduce unit cost. Whether it is special purpose or standard is immaterial he said, as every good production engineer realizes that machine costs must be amortized against the product or products.

"If we wait until we are influenced by the labor market," Ernst added, "it is too late".

Reflecting typical automobile industry thinking in regard to its high production requirements, Riedl foresees use for more special machines and substantial reductions in man-hours consumed through more ingenious use of tools, fixtures and handling devices.

"The pressing need for taking man-hours out of our jobs after the war," the Nash man said, "will open up a new field for automatic handling devices and multiple automatic machines."

Declaring automotive requirements are specialized and unlike those in most other industries, Schmitter suggested that product design would play a large part in countering a trend toward "Rube Goldberg" designs in production equipment. "It seems to me," he said, "That the design lays the foundation for the cost structure and determines the machines and to a degree the sequence of operations. I think as labor costs go up you are going to see more care taken in designs."

DIVIDED OPINION ON QUESTION

● 2. What recommendations would you make for the improvement of specific types of machines?

In answering this question, the Milwaukee group was divided, with opinion depending upon the type of job and the material being cut. Three men believed that recent improvements in cutting tools had antiquated many present machine tool designs. The fourth man, citing his experience in cutting monel said that tool failure always preceded machine failure.

Because he has generally found today's machines adequate, Connors believes that efforts to improve tooling and fixturing are more important considerations than revised machine design. "If I want to make more pieces per hour," he remarked, "The wall I always bump up against is the fact that the tools will not stand more."

Basing his judgment on aircraft engine parts production and in sharp contrast, Riedl said "tools have been advanced further than machines."

TOUGH JOBS PUT MACHINES TO TEST

One example of machine failure cited by the Nash engineer was an engine mount bracket of about 363 Brinell, finished on a large milling machine with a one tooth, negative rake fly cutter. To perform the job, he said, the machine is run at "a cutting speed of 480 feet per minute."

"The tool will stand up," he continued, "but the machine won't. We tightened the spindle every week, and the wear on the table was terrific. Since we have gone to negative rake tools, we are getting beautiful finishes, but the machines won't stand it."

Schmitter said, "Our experience has been that with the higher hardness that we encounter as contrasted with automotive and aircraft work, standard machines don't stand up. We have gone back to the manufacturers and asked for improvements on bearings, and design of the mountings. In some cases we have met with cooperation, and in some cases we haven't.

"In a number of instances," he continued, "we have found the life of some of this equipment has been three, four or five years, which I think is entirely too short. In other words, it is our observation that the limitations are in the machines and not the cutters.

"To qualify that," he explained, "the freer cutting steels we are using now have eased the situation for cutters more than for machines. As a general observation on postwar machine tool design, I think much can be accomplished in gear mountings, bearing mountings, better sealing, keeping the oil in and keeping abrasive material out, complete enclosure of gears, with adequate lubricating systems."

Riedl also scored bearing failures, saying that this trouble was encountered even on specific types of precision machines. "We buy bearings by the dozen," he explained.

GREATER RIGIDITY IS DEMANDED

Lack of rigidity was a charge made by several of the conferees against almost all types of machines. One man said his concern now appends to the builder's bill with specified machine weight, this memo: "Put on so many more thousand pounds of metal, and how much do you want for it?"

Ernst called for more rigidity in machines, particularly in clutch designs. "We are having trouble" he said, "in effecting good cantilever operations on turret lathes. The clutches won't hold up."

"In some cases," Ernst continued, "we see the need for increased motor power. I know of a milling machine manufacturer who is working on a postwar design of a much heavier machine, with increased bearing sizes and increased motor sizes. Where they formerly used 30 horsepower, they are visualizing the use of 50 horsepower."

● 3. Are present machine tool lubrication systems satisfactory? If not, what recommendations would you make for their improvement?

Despite the efforts of manufacturers to improve tool lubrication with presumably fool-proof, semi-automatic systems, production men continue to complain on this score.

Riedl summed up the consensus of opinion, saying, "We shut off on a Saturday night, third shift. When we start Monday morning we have got to run most of the machines at least an hour before they will come up to temperature in order to produce the precision we want."

SUGGESTIONS ON STANDARDIZATION

● 4. What specific recommendations can you make for the standardization of machine tool parts to simplify maintenance?

For the second time in the five Round-Tables held to date, criticism was leveled at the lack of standardization in tapers and spindles.

"It seems as if the builders should be able to equip the same size machines — regardless of who makes them—with the same type and size taper," Connors said.

On a subject related to parts standardization, the Evinrude engineer suggested that builders of so-called standard machine tools could do much to simplify the ordering of replacement parts. "They distribute literature which

(Concluded on page 138)

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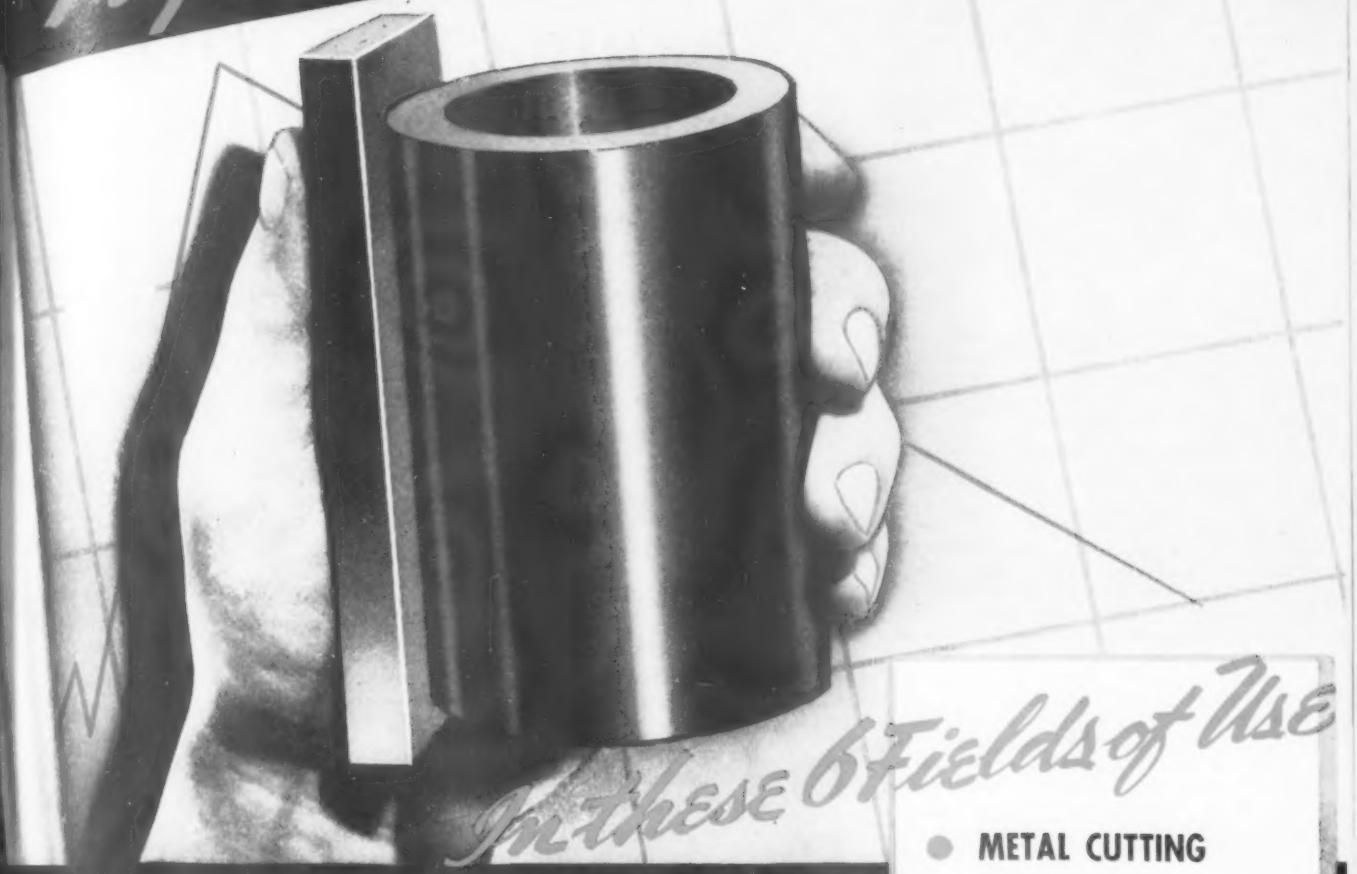

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PRODUCTION POLL FORECASTS TRENDS IN METAL-WORKING

IN ONE of the most ambitions editorial projects undertaken recently by the trade press, the publishers of The Tool Engineer have completed the first national survey of postwar trends in metal-working and mass production industry.

Clarifying for the first time general opinion on such subjects as excess machine tools, postwar precision standards and manufacturing techniques, the Poll covers the 20,000 "first" readers of this magazine. The actual percentage of influential industry opinion reported already exceeds by nearly 10 times that known to be used by the two leading U. S. national political opinion surveys.

Industrial marketing experts who have studied the Poll state that it undoubtedly reports "with an exceptionally high degree of accuracy" postwar trends in metal-working.

CONSENSUS IS INDUSTRY-WIDE

The questions posed were previously determined to be of vital interest to both users and producers of metal-working equipment. Industry-wide opinion in answering these questions is at wide variance with that of some of the prominent buyers and users of machine tools who were polled earlier in this magazine's nation-wide series of PRODUCTION Round-Tables.

This emphasizes the fact that reliance on individual opinion regarding such vital subjects is dangerous. Since manufacturers, generally, cannot produce equipment designed specifically to meet the individual requirements of every industry, they must seek the consensus of requirements and then endeavor to supply machines and tools with broad acceptability.

PROBING FOR SIGNIFICANT TOPICS

In making the survey, the Editors sought not only to clarify and illuminate thinking on widely debated subjects, but also to determine what subjects this magazine can explore editorially for the benefit of its readers. The information gained will be reflected in future issues of The Tool Engineer.

Unlike the only other publicized survey of postwar machine tool requirements—made by General Motors Corporation in its own specialized shops—this Poll points up the demands of every conceivable type and segment of the American metal-working industry.

A few of the hundreds of peacetime products listed on the Poll ballots returned included:

A wide variety of electrical goods, automobiles, buses, trucks, tractors and farm implements; domestic appliances, including refrigerators, washing machines, stoves and ironers; machine tools and metal-cutting and fabricating equipment; industrial mill supplies; screw machine products; instruments and watches; matches; materials handling devices; aviation products—airplanes, engines, propellers, and parts; ships and railroads; hosiery, cloth, shoe, printing and bottling and canning machinery; optical devices; irrigation and oil field equipment.

In analyzing the Poll results, probably most newsworthy today is the 68.81 per cent favorable to the purchase of DPC excess machine tools. Until now, neither Government or industry has had any reliable indication of the overall acceptability in peacetime of the more than 100,000 war-built, public-owned machine tools.

The 88.63 per cent envisioning greater precision in postwar manufacture certainly augurs well for the gage and instrument industry.

Machine tool builders may ponder the widespread user-demand indicated for changes in machine tools to fully utilize improvements in cutting tools to provide greater motion economy on the part of operators, and to improve the adequacy and accessibility of lubrication systems.

Despite the overwhelming leaning toward the eventual adoption of electronic controls, memos from readers revealed an urgent demand for education in applying these new devices.

Careful analysis of the vote indicating a trend toward a reduction of stock removal through adoption of such methods as precision forming, casting and stretching indicated to the Editors little likelihood that the use of machine tools per se is doomed. Rather the tendency to reduce the amount of metal removed to finish will continue in postwar production planning.

THE END

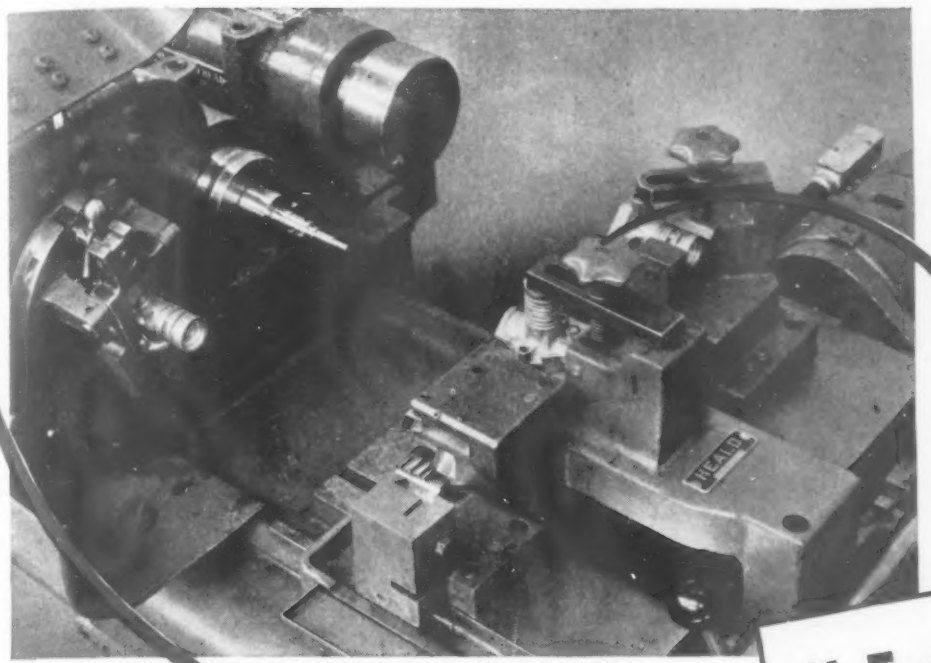
The Bramson Publishing Company's PRODUCTION POLL of the Metal-Working Industry

• In the judgment of the Staff Editors of this publication, the answers to these questions are of vital interest to users and producers of metal-working equipment. The scope of the Poll this month has been greatly extended. For the past three months it has been based on answers obtained from outstanding production executives participating in this magazine's monthly PRODUCTION Round-Table. Now, the Poll encompasses the opinions of a wide cross-section of the more than 20,000 *Tool Engineer* readers.

	QUESTION	% Replying YES	NO
1	Do you envision greater precision in postwar manufacturing?	88.63%	11.37%
2	Where advisable, will you replace prewar equipment with war-built or DPC equipment?	68.81%	31.19%
3	Are changes in machine tools indicated to fully utilize improvements in cutting tools?	65.76%	34.24%
4	As a general rule, should machinery controls be changed so as to provide greater motion economy on the part of operators?	84.89%	15.11%
5	Do you favor electronic controls?	86.38%	13.62%
6	Are lubrication systems on machine tools today efficient, adequate and accessible?	40.44%	59.56%
7	Do you see a trend toward a reduction in stock removal for finish, by such means as precision forming, casting, forging, stretching, etc., etc.	77.19%	22.81%

Fixtures for All Requirements

ON VERSATILE HEALD BORE-MATICS



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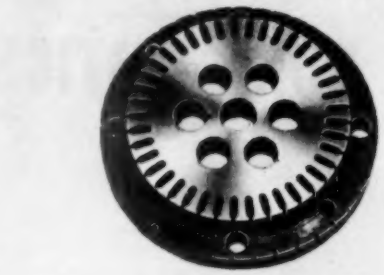

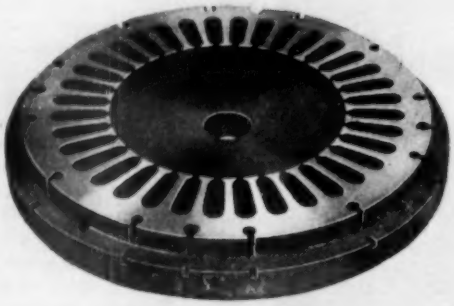

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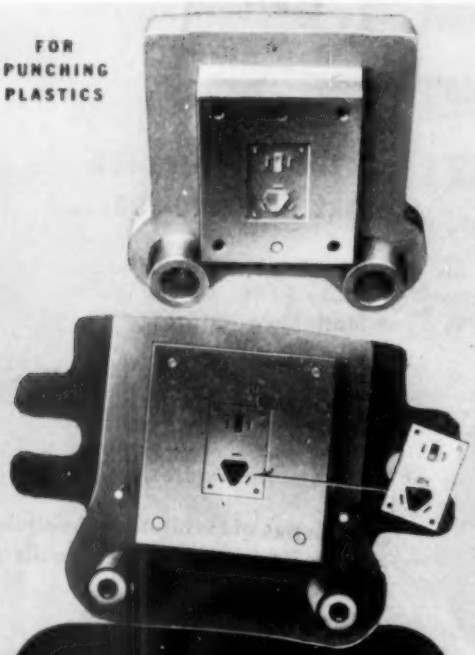

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T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

T. N. SANDIFER

Special dispatch from The Bramson Publishing Company's Correspondent in the nation's capital

WASHINGTON

THE SHIFT to peacetime production is under way, officially at least. The War Production Board has issued regulations under which its field offices may authorize manufacture of civilian type products under conditions which will not interfere with the war effort.

However, the word here is not to look for any sensational reconversion developments at this time. The changeover where it is permitted, will be spotted, and will be very rigidly restricted, both as to what can be made, how it can be made, and what material it will be made from. Incidentally, there will be the same tight regulation as to who will make these things, both as to which plants and what men.

WPB vs. ARMED SERVICES vs. CONGRESS

Nevertheless, a start has been made. The interpretation here is that WPB, in line with the current activities of Congress, is merely making certain precautionary moves so as not to be caught flat-footed in case of a sudden break in the European war situation.

Actually there is the same internal disagreement between WPB and the armed service procurement agencies, and production chiefs, as to the timeliness of the move. In Congress there is the desire to have essential legislation on the books, and at the same time, to not spend the campaign weeks in Washington. Another recess, barring war developments, is scheduled, according to the present outlook.

The Senate Committee on Problems of Small Business, of which Senator Murray, Democrat, Oklahoma, is chairman, has gathered some reports of individual small manufacturers' activities in the war period, that furnish a close-up of production problems licked in getting into war manufacture, and what these firms are up against in the reconversion scramble.

SMALL PLANTS EYE THE FUTURE

Some of these industry cases, taken directly from on-the-ground surveys by Committee members, follow. Incidentally, they throw a white light on the ingenuity of the small shop operator, and the small city shop, in getting going despite difficulties.

Firm Number One: Started by an electrician who came back from World War I and eventually went into a small shop business. Pearl Harbor found the shop making theatre marquees and signs, also interior lighting for theatres and business places.

Realizing they would probably be classed as "non-essential", this shop set out to find war work for its equipment which was designed for handling sheet metal and light structural steel. Eventually, and through persistent effort, this shop got a contract making small aircraft terminals, a critical item that nobody seemed anxious to attempt to manufacture due to the close tolerances required, and the fact that the work was on stainless steel. Despite having to adjust their tolerances from ¼" down to thousandths, and that the steel was hard to work with, this shop started on an order for 5,000 units.

The job involved getting all new equipment and tools, and it was soon found that delivery dates were impossible on special tools and other equipment needed. Therefore, the shop designed and made practically all its own tooling for three hand screw machines.

They worked up to 500 units per day, and were asked to double production. The shop got a loan for equipment from the Smaller War Plants Corporation, and by using its original equipment, plus the new specially-designed equipment, got up to an output of 3,000 units every 24 hours.

● Reconversion has developed into another Battle on the Potomac. WPB has gone through the motions of launching a program, but WMC has torpedoed it with tightened manpower controls. Trustworthy Washington observers say, "Don't look for substantial increases in civilian output until the European war actually is over".

Even so, the shop had to beg and borrow precision tools. At one time it was confronted with an eight weeks' delivery for chasers and blocks for a special thread, needed for a particular piece immediately.

The Air Corps, for whom the work was being done, contacted its different branches without locating any, and a canvass by the firm of all manufacturers making such die-heads, was fruitless. So, the report shows, the shop-owner's wife started out, and found one part of the chasers on one distributor's shelves, and the other parts on another distributor's shelves, took them to the factory, had them ground together, and by the next evening had threaded 800 units with these chasers.

There is more to this shop's war history, but the upshot, is that when war production ends, it will not go back to making theatre marquees. It is tooled for making this particular aircraft part, and as there has always been trouble in getting them, the shop intends to stay on them.

Firm Number Two: The war found it making wire and metal display fixtures, one of the first products to be eliminated. The plant was shut down for more than 9 months, while the owners tried to get into war production. While this was going on, the plant lost most of its key workers to larger plants in the area. When it started again, most of the foremen had to be trained.

This plant is looking ahead. First difficulty it sees is getting replacement for worn-out equipment. Like many others, it has been running its machines 24 hours a day. It states it cannot get priorities to replace this equipment, consequently, the end of the war will find this plant, as many others, with a lot of equipment in very poor condition; also a considerable amount that will be obsolete.

STUDY PEACETIME POSSIBILITIES

To meet peacetime competition, it believes it will be necessary to obtain either new equipment, or good used equipment, and it is looking to Government surplus machines for the latter.

As one of the firm executives said, "We know that there are a lot of punch presses and lathes, in various Government plants, and some of the equipment we need is punch presses. We do a small amount of machine shop work, also."

One thing this plant is doing, its officials report, is trying to get a widely different line of production going for peace, so that if one line fails, perhaps another one will prove up, and keep the shop going.

This firm incidentally, has been making metal radio cases, for military aircraft, also tank and landing-craft transmitters, and some receiver cases. It was all new work, to the shop and its force. As a result of its war production experience however, the plant's executives believe they are better equipped to produce for peace than they were before. As one of them said, "Our peacetime product was one where, if possible, the hole was within a sixteenth of an inch, and if so, it was satisfactory. We could file it out and make it fit. Now the boys have learned to work to closer tolerances, and there is no question our peacetime product will run more smoothly than it did, prior to our having worked on this type of material."

WOULD BUY SURPLUS MACHINES

The firm followed the policy of using its existing equipment where possible to fit in any new contract work, but if this was not possible, it fitted in one or two new machines where it could make room. It has not added any floor space.

When the war work ceases however, the firm knows it will have to reconvert, and it is planning to get new equipment from surplus war stocks—slightly used punch presses, or new ones, among other items.

There are many other such plants that could be listed, and their experiences set forth in the same detail. Among these would be a firm fabricating steel for building, that was able to keep going on war work, after locating other idle facilities in the area, and open equipment it could use; and another fabricator of structural steel bridges and buildings; and a plant

(Concluded on page 111)

War Demonstrates the VALUE of

DANLY NATIONAL ASSEMBLY

Danly National Assembly saves thousands of hours daily in die set delivery—hours that mean war production.

Seven branch assembly plants are stocked with the basic precision parts, ready to assemble Danly Standard Die Sets to your specifications for immediate shipment.

Now, with branch stocks restored, Danly National Assembly assures you faster delivery, smoother press operation, longer life for your dies, lower production costs.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois

CHICAGO
2100 So. 52nd Ave... *Lawndale 7440*

DETROIT
1549 Temple Avenue.. *Cherry 6666*

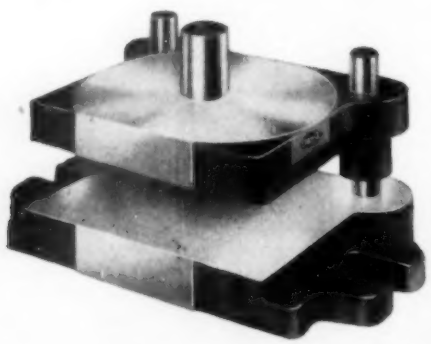
CLEVELAND
1550 East 33rd Street.. *Express 0300*

DAYTON
990 East Monument... *Fulton 6651*

ROCHESTER
16 Commercial Street.. *Main 2554*

LONG ISLAND CITY
47-28 37th Street.. *Ironsides 6-8080*

DUCOMMUN METALS & SUPPLY CO.
Los Angeles..... *Kimball 0181*
4890 South Alameda Street



DANLY DIE SETS

DIE MAKERS SUPPLIES • *Welded Steel Fabrication*

—CAPITAL COMMUNIQUE—

(Concluded from page 109)

building machinery for laundries and dry cleaners that went into foundry and castings for the war effort.

With firms agitated over the place they will occupy in the coming peacetime period, the House Military Affairs Committee is perhaps a trifle late in reporting on its work in connection with the so-called engineer-leasing services that were flourishing at the peak of the war effort.

Nevertheless, as committee members point out, it was not until late 1943, and even early 1944, before any attempt on the part of a responsible government agency was made to put a stop to practices that are blamed by the Government and the committee, for many evils in war contract operations.

"ENGINEER-LEASING" CURTAILED

Committee members now indicate they are satisfied that the War Manpower Commission has taken adequate steps to halt the more flagrant activities, and that the investigation, which was very detailed, has had effective results.

"It is believed that if both Government and industry continue their efforts, not only can this practice be completely abolished, but also untold millions of dollars can be saved to the taxpayers in the consequent reduction in the unnecessary costs of war," the report claimed.

However, members recalled, by the time the investigation got under way, "so far-reaching had the practice become, that time did not permit the conduct of an exhaustive survey of all the concerns now engaged in it."

The report lists quite a few however, and is careful to point out that the committee went carefully into the angle as to what constitutes true engineering services, and what is a parasitic practice that has fastened itself on industry during a period of national emergency."

ARMY-NAVY STANDARDIZATION

New economies in production for the armed services are expected to follow the development of the Joint Army-Navy Standardization Program, designed to facilitate design and manufacture of various items. Thus, it is claimed, it is now possible to set up procurement specifications combining the technical requirements of both services, in a single document.

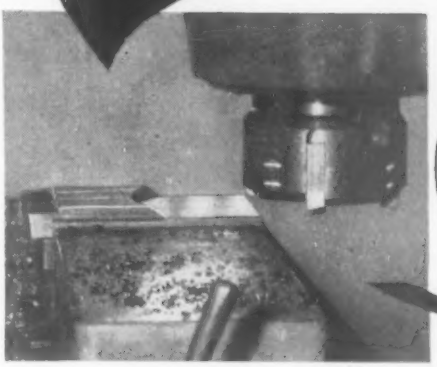
This is made possible by considering the use to which a given product will be put by the Army and the way in which it must serve the Navy. The interchangeability of parts alone, under the present stress of emergency, it is said, would justify the plan. The manufacturer meanwhile, works to a single set of specifications for the product, intended for both services.

As an illustration of the possibilities, products used jointly will carry both Army and Navy numbers on the label. Thus, for example, if an Army radio corps happened to be stranded on an island, it could secure from any naval vessels' supplies, components to repair or complete its equipment, since the parts would be interchangeable.

THE END

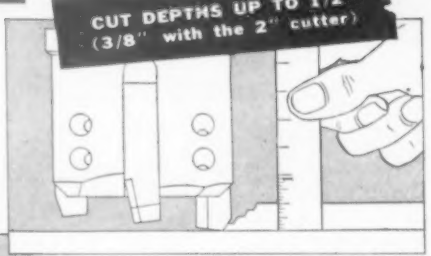
KENNAMILL STEP-CUTTERS

A Simplified Means To Multiply Milling Production with Available Equipment



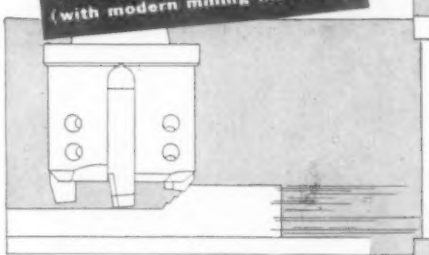
Kennamills are inserted blade fly-cutters that, in most cases, enable available horsepower to be fully utilized in chip removal.

CUT DEPTHS UP TO 1/2" (3/8" with the 2" cutter)



Desired depth of cut is divided into equal steps.

FEED UP TO 25"/MIN. (with modern milling machines)

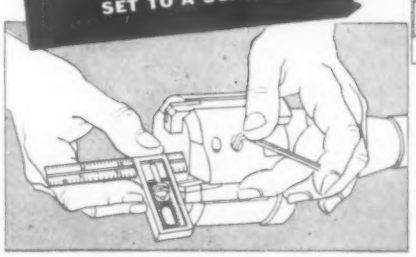


High rates of milling made possible on all commonly used steels.

GRIND TO A TEMPLATE

Blades are resharpened to template on ordinary carbide tool grinder.

SET TO A SCALE



Grinding in the head is unnecessary.

Kennamills bring the advantages of high-production carbide milling of steel to every shop that has milling machines of reasonably recent manufacture. They are inexpensive, easy to set-up, and a cinch to maintain. Get in step with modern carbide milling by using this simplified method—write today for catalog information on Kennamills.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

MACHINE TOOLS

. . . news and trends in the Machine Tool Industry . . .

Order Writing and Shipments Drop; Manpower Critical

● After bounding upward during April and May, the overall trend in machine tools was reversed in June. Most of the rush orders resulting from changed war materiel requirements having been placed by early June, new business dropped off nearly 25 per cent, shipments fell back to the April level.

Official Government figures, compiled by WPB statisticians, reveal total June shipments of $41,331,000. Revised and final figures for May shipments, the War Production Board's Tools Division has announced, show that $41,819,000 in new machine tools were moved from American plants that month.

Decreased military requirements and the imminent end of the European phase of the war—with its consequent evaporation of almost all war plant machine tool orders—are startingly reflected in the June order-writing picture. Net new orders during the month, after cancellations, amounted to $48,427,000. Washington record books showed. How sharp the decline actually was may be seen by comparing this figure with the new order record of $59,852,000 in the previous month.

Despite declining new orders and their best efforts productionwise, machine tool builders have been unable to keep even with the board during the past few months. The industry's backlog rose again in June. Unfilled new orders on June 30, totaled $192,782,000. At the end of May, the builders' books showed unfilled orders valued at $185,746,000.

Though every indication points to a continued decline in new orders, the industry's skilled manpower problem has become so critical that it is anybody's guess when a really substantial cut in the mounting backlog can be effected. Recently added to the manpower worry is a new wave of absenteeism in some machine tool centers.

With domestic war orders falling off, talk of possible new, large English and Russian orders are circulating in trade circles. Well-informed leaders of the industry, however, point to yet unsolved financing of such prospective orders, and to the strong possibility of Washington foreign political and economic bargaining reducing such business to a relatively small volume.

The popular conception of continued boom business in machine tools, as a result of the recent Nelson order permitting placement of orders for peacetime equipment, is a fallacious one. Some industry leaders are concerned about the general lack of understanding of the War Production Board's recent reconversion retooling order.

Though this business should begin to show up on the order books during the next two months, it is not believed that it will equal or offset the loss of war-plant orders. The important point is that none of these orders have any priority rating. As long as war work is included in a builder's backlog, he cannot send these new jobs into his shop if they might interfere with war plant delivery schedules.

Nonetheless, announcement of the retooling order was welcomed by builders. For months, acting through their National Machine Tool Builders Association, they have been demanding such an order to smooth out the bumps on the road back to peacetime production. Though these peacetime orders may not be filled for months, knowledge that specific types of machines will be wanted by regular customers permits the employment of engineering departments in design layout and inevitably speeds the day of delivery to civilian production lines.

As much as any segment of American business, machine tool building is an accurate barometer of industrial trends. Its boom periods always presage an increase in the tempo of mass manufacturing; its decline in output always antedates a leveling off or slump in metal-working industry output.

In June, and again last month, machine tool industry activity foreshadowed a sharp change in the complexion of American industrial output.

(Continued on page 136)

● What is the postwar outlook for the machine tool industry? For the interest of TOOL ENGINEER readers, who are buyers and users of machine tools, leaders in the industry have been invited to present their views of this vital question

MACHINE TOOLS ARE THE KEY TO WORLD PEACE

☆

LEIGHTON WILKIE

CHAIRMAN
THE DOALL COMPANY, SAVAGE TOOL CO., AND CONTINENTAL MACHINES, INC.

Wilkie calls for positive approach

● Those who feel that the machine tool industry is about to go into a long dormant stage should read Garet Garrett's new book, *A Time is Born*. This well-known economic analyst traces the evolution of the machine, vividly portraying its importance as well as the irrational economic behavior of a machine world.

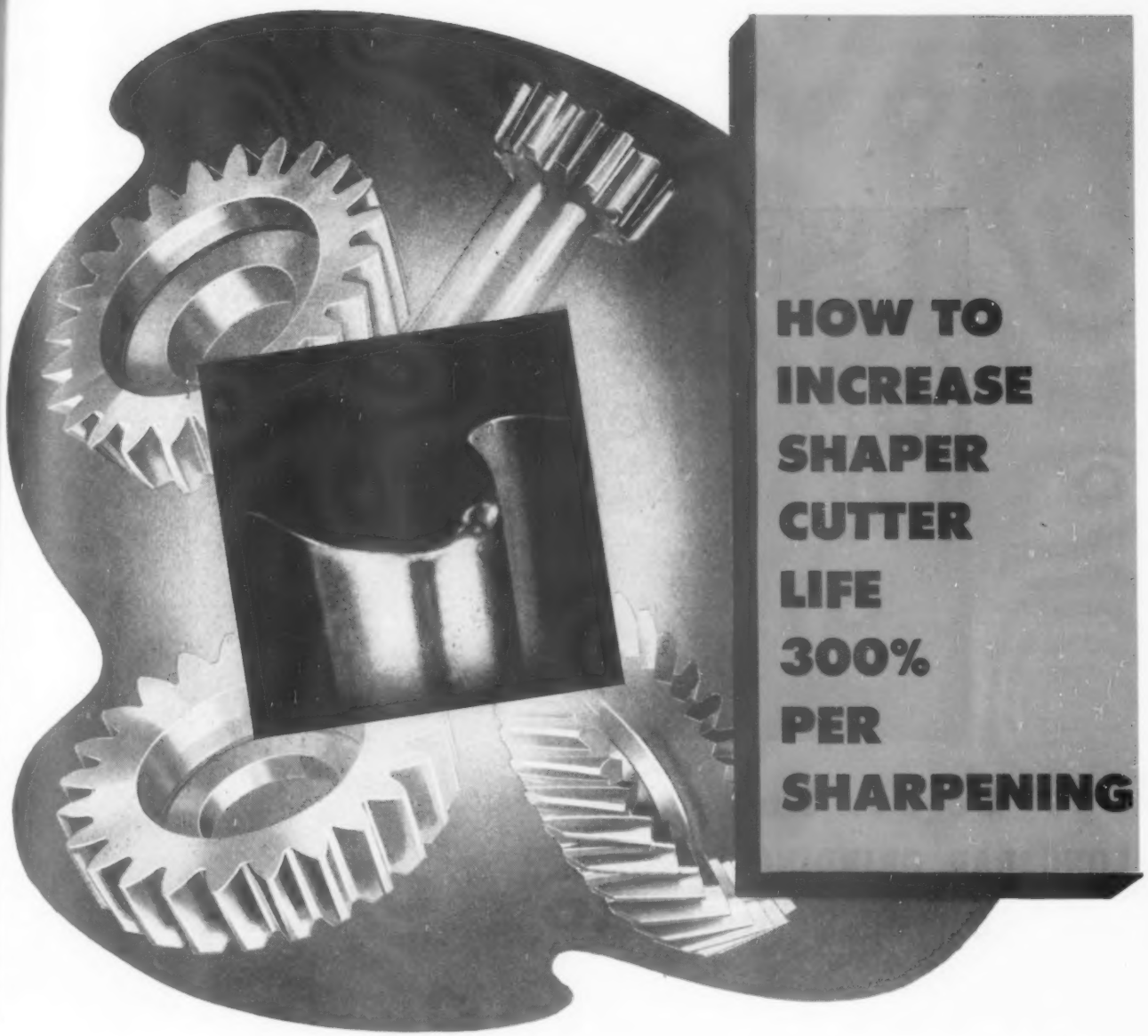
In analyzing the account between man and machine and its economic reckoning, he shows how the machine touches life in its deep concerns; that it has enabled the world to destroy the cruel discipline of despairing hunger while doubling its population.

Now—raising labor to the rank of full human dignity—it is a symbol of release to the backward races of the world. Garrett is sensitive to tremendous changes in the making for a new world. These will not be planned but will grow unawares out of the economic upheaval and out of the contributions of the machine.

The huge increment in population created with the help of the machine, the high standards of livelihood it offers for all mankind, are inspirations to all who contribute to the advancement of machinery. The machine tool—with its unique ability to re-create itself—is the seed out of which grows our entire industrial organism.

It follows that as other nations become industrially self-sufficient, there will be fewer causes for wars. The time referred to in this book is the coming era of the chemical production of raw materials, as already demonstrated in the case of Nylon and synthetic rubber. Nations may, before long, be able to team their chemists with their machine tool people to produce abundant self-sufficiency.

Since all wars are economic, the era visualized holds the potentialities of eliminating wars. The machine tool will continue to be the root of the industrialization tree, no matter how lofty it grows or what shape it takes. Only with a positive and optimistic approach to the immediate postwar years can the men of this industry be prepared for their great responsibility to the next generation.



HOW TO INCREASE SHAPER CUTTER LIFE 300% PER SHARPENING

One of the simplest methods of increasing the life of shaper cutters is to protect the cutter against nicks like the one above. Normal amount of stock removal to sharpen a Michigan shaper cutter is only around 0.007 inches on the average. A nick like this one may mean the necessity of removing .025 to .030 inches of metal to resharpen the tool. The potential output of the tool for three additional sharpenings has thus been wasted.

While nicks in gear cutting tools may be caused by a variety of reasons, the most prevalent one is carelessness in handling. The very hardness which gives Michigan gear cutting tools their outstanding performance means that such tools require careful handling to prevent chipping, nicking or breakage. Extensive field investigation has revealed that in 4 out of 5 cases of damaged tools, the damage is due to incorrect or careless tool handling to and from machines, in the store-room, in sharpening (sharpening heat-checks which later result in tool failure), etc.

Do you have a copy of "Shaping"? Ask for Bulletin GS-42.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD . . DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

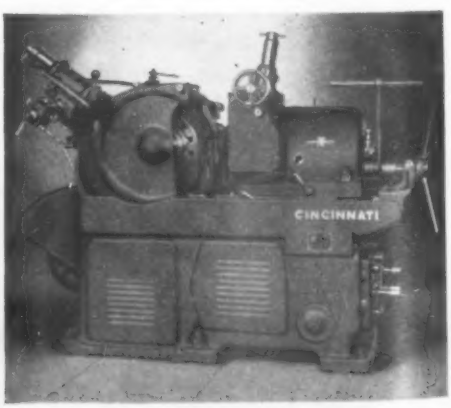
Grinding hollow piston rods for hydraulic machines, on a CINCINNATI No. 2 Centerless Grinder equipped with a Type C Long Bar Fixture.

Do You Know the LONG BAR GRINDING POSSIBILITIES of the Centerless

Round tubes, rods and bars of all types of metal are ground quickly, accurately and continuously on the CINCINNATI Centerless Grinder by using Cincinnati engineered Long Bar Fixtures. ¶ For the No. 2 machine, these fixtures are available in three standard sizes. Type A is for bars ranging in diameter from ⅛" to 1¼" and lengths up to 2½ feet. Type B for bars ⅛" to 1¼" in diameter and lengths up to 8 feet. Type C for bars ½" to 2" in diameter and lengths up to 18 feet. For the No. 3 machine, an additional size is available . . . type D for bars 1" to 4" in diameter, and lengths up to 18 feet; and ⅛" to 1" in diameter in lengths up to 8 feet. Then there is the non-metallic bar grinding fixture, for fibre and molded plastic tubes and rods, ranging in diameter from ⅛" to 3" and lengths up to 5 feet. ¶ The engineers here at Grinding Headquarters will be glad to discuss your long bar grinding requirements with you. Catalog G-456-1 gives specifications and full details on CINCINNATI No. 2 Centerless.

CINCINNATI

Front view of the CINCINNATI No. 2 Centerless Grinding Machine. Write for catalog G-456-1 which gives complete information on all features.



CINCINNATI GRINDERS INCORPORATED

CENTERTYPE GRINDING MACHINES CENTERLESS GRINDING MACHINES

CENTERLESS LAPPING MACHINES

INDUSTRIAL NEWS DIGEST

. . . a review of significant developments and new techniques in mass production industries . . .

Pricing Policy Established for Excess Machine Tools

WASHINGTON—Speculation regarding the Government's pricing policy on surplus DPC machine tools was ended here when William L. Clayton, Surplus War Property Administrator, announced a definite price formula.

The plan, it is believed, will enable war contractors to purchase immediately Government-owned excess standard general-purpose machines for delivery as soon as contracts on which they are used have been terminated.

SWPA expressed the opinion that its pricing formula will facilitate prompt and orderly disposal of many machines, with avoidance of public expense and loss arising from depreciation, obsolescence, warehousing and handling that would result from delayed disposal.

Favoritism, speculation and other inequitable results, feared by both machine tool builders and users, will be avoided through application of the plan, the Government agency believes.

Procedures for purchasing standard equipment and a price policy for special machines will be announced later.

The schedule for standard equipment has two bases:

(1) When machines are not in the purchaser's plant, they are sold with an immediate depreciation of 15 per cent, less two and one-half per cent per month for the first six months, one per cent per month for the next four months, and eight-tenths of one per cent for the next 26 months.

(2) When machine tools are sold to a purchaser or lessee who has the equipment in his own plant, the price is five per cent higher than when it is in an outside plant.

The difference in prices arises from the fact that in the second instance the purchaser is aware of the condition of the machines and is not faced with the cost of moving the equipment into his own shop.

SWPA'S depreciation price policy is based on the machine tool builder's original f. o. b. price, including electric equipment and standard accessories. The price to the buyer is f. o. b. at the storage location. Tooling may be obtained by purchaser on the same depreciated formula.

The depreciation price period, it was explained, is fixed from the date a machine tool was originally put in use, to the date of the termination of the lessee's facilities contract, or to the time the machine is withdrawn from the contract, whichever is earlier.

Report Shows Little Decline in Cutting Tool Demand

WASHINGTON—Contrary to scattered trade reports, metal-cutting tools still are in heavy demand according to the Tools Division of the War Production Board. In releasing statistics on monthly shipments and new and unfilled orders of tools for the first half of 1944, the Government agency indicated no immediate relief is expected in supplying them for civilian production.

In view of the rapidly changing war materiel requirements situation, however, the WPB pointed out that some relief may be expected momentarily in certain types of metal-cutting equipment.

Total cutting-tool shipments last year, the WPB revealed, were valued at $417,510,000. Unfilled orders at the end of the year amounted to $67,648,000. Despite the still critical situation in cutting tools according to the Government, shipments have declined slowly, but steadily since the first of the year. In January, 1944, shipments totaling $27,582,000 were made. By June, the value of shipments had dropped to $23,269,000 monthly.

New orders during the first half of

(Continued on following page)

IMPROVISED SPOT FACER

Difficult spot facing job is performed on an improvised small drill press setup.

● Trouble loomed when the American Central Manufacturing Corporation, Connersville, Indiana, was faced with spot facing bolt holes in the flanges of aircraft engine collector rings. Work contours prevented the down stroke of a vertical spindle.

The solution consists of inverting a Delta drill press and raising the spindle through a plate on which the work is positioned. Bolt holes are slipped over a pilot shaft. A 1/16 turn of the raised spindle engages the spot facing tool, which is then applied by partial withdrawal of the spindle.

"GREENIE" — *Hole in One*

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

HELLO BOSS! THIS IS GREENIE--- I'VE GOT A SURPRISE FOR YOU IN THE SOUTH END OF THE FACTORY— COME SEE WHAT HAPPENED ON MY FIRST TRIP WITH THE OVERHEAD CRANE!
RALPH DAVIS

(Continued from preceding page)

this year, however, have risen. In January, adjusted new orders, less cancellations, totaled $23,059,000. In June, they were valued at $25,797,000. Nonetheless, production has been regularly exceeding new orders this year, and, as a consequence, the backlog of unfilled orders has dropped $10,000,000. In January, the backlog stood at $63,125,000. In June, it had dropped to $53,775,000.

WPB reports that this data represents practically 90 per cent of the cutting tool industry. Included in the data were broaches, chasers, dies, taps, twist drills, milling cutters, turning, planer and shaper tools. It does not cover tools made in factory tool rooms.

Production Jumps 42 Per Cent Under Wage-Incentive Plans

WASHINGTON — Incontrovertible proof that "more can be done", that much labor output in war industry is far below normal capacity, are the results being obtained today with modern wage-incentive plans.

With the facts "straight from the horse's mouth", advocates of the plan last month offered production figures that proved once and for all that America is unnecessarily adding to the cost of its mass produced war goods and limiting their output through loss of existing manpower.

In a survey of wage-incentive plans in 86 foundry and forge shops, the War Production Board itself has found that production increased 42 per cent in 20 of those plants by application of the principle of "more work, more pay."

These findings, reported by WPB's Management Consultant Division, indicated that if all the plants have shown the same production gain as the 20 for which figures are complete, the effect on the wage-incentive plans should be equivalent to adding 7,000 men to the labor force in these 86 plants.

Despite assertions that labor unions are adamant to permit the establishment of such systems, the WPB reports that in 61.4 per cent of the 86 plants surveyed, wage incentives were applied by management in cooperation with the AFL or CIO. Of the remainder, eight per cent of the plans were worked out with independent unions, while in 30.6 per cent of the cases no union was involved.

The WPB survey covered wage-incentive plans of various types. Thirty per cent are based on individual performance, and 50 per cent are based on group performance. Plant-wide performance, is the yardstick in 16.3 per cent of the cases, while the balance of three per cent represents plans where production is measured on performance both by individuals and by groups.

The various plans are classified according to the basis on which the standard of production is set. In 26 per cent of the cases, standards have been set by time studies, while in 67.5 per cent of the cases, past performance is the yardstick. The remaining 6.5 per cent are based on a combination of time studies and past performance figures.

Over a 90 day period, increases in production took place in 20 plants located in five regions as follows: New York, 47.6 per cent; Boston, 22.5 per cent; Chicago, 47.5 per cent; San Francisco, 45.3 per cent; and Detroit, 45.3 per cent.

● Deserving much credit for the victory we have achieved on the production front, the gage industry should assume a new and more important place in peacetime metal-working. Here is another in The Tool Engineer magazine's series on the postwar outlook in metal-working, this month by a prominent gage manufacturer.

THE CARBIDE AGE
Promises Postwar Benefits to All Mankind

W. B. DUNCAN
GENERAL MANAGER
WESSON COMPANY

● Over 21 years ago, we made carbide tipped cutting tools which to the best of our knowledge, were the first made in America. The tips were of Widia metal, imported from Germany's then famous Krupp works.

Industry has seen revolutionary advances in carbide tool engineering since those first tools were introduced in 1923, but the real "miracles" of "The Carbide Age" have been performed in the last few years. Some of these "miracles" are still to be told, but as victory draws closer, specific performance facts are being made available for the benefit of all.

As the cutting abilities of carbides became better known, metallurgists extended themselves in creating new alloys which previously would have been non-machinable. Machine tool builders redesigned their machinery to provide the rigidity and greatly increased feeds and speeds that carbide tools made possible. New carbide tools were designed to do jobs never before attempted.

For the first time, for instance, a reaming job in Rockwell 40 steel is being done by carbide tipped reamers in 2 minutes, 38 seconds, as compared with 25 minutes required with previous tools.

Again for the first time, special carbide tipped cutters reduce four operations to one, on a connecting rod (SAE 6412, 40 Rockwell "C") and are slashing production time from 13 minutes to one minute. In addition, these carbide tools make it possible to eliminate many grinding machines, and on this particular job released 105 skilled operators for other vital work.

Everyone, in every walk of life, eventually will benefit by industry's adoption of carbide tools, because faster production means lower costs; finer finish and higher precision with carbides assure better products at less cost, and all of these advantages eventually benefit the consumer.

The Carbide Age in industry has arrived, and it will have a tremendous effect on America's economy!

NEW DEPUTY DIRECTOR WPB TOOLS DIVISION

● WASHINGTON—Paul S. Gaston has been named Deputy Director of the Tools Division, War Production Board. His appointment was announced by William K. Frank, Director of the Equipment Bureau, WPB.

Gaston succeeds Franz T. Stone, who resigned to accept an assignment with the Office of Strategic Services.

Before joining WPB in January, 1942, Gaston was associated with the Cleveland Tractor Company.

ASA-Approved Thread Standard Permits Interchangeability

NEW YORK—So that Whitworth screw threads may be produced more easily by American manufacturers while maintaining complete interchangeability with threads of British Standard Whitworth form, the American Standards Association has approved a new war standard, Screw Threads of Truncated Whitworth Form, B1.6-1944.

Requested by the War Production Board, this standard gives complete specifications including gaging instructions, for American Truncated Whitworth Threads which (1) are interchangeable with British Standard Whitworth Threads; (2) can be produced with tools having flat crests and roots; and (3) can be checked with threaded plug and ring gages having flat crests.

(Continued on page 118)

Typical Results Attained by Plunge Grinding Threads and Forms with a Crusher Dressed Wheel

SHOCK ABSORBER

This part consists of two steel tubes bonded together with rubber. The outer tube is SAE-1015 steel, .093" thick with a ½" threaded section on one end—threads 2⅛"—16N-3. These threads are plunge ground in a fraction of the time without the generation of the high heat inevitable with the single point wheel which caused tube and rubber to separate.

IMPELLER SPACER

This spacer, 2.223" long is ANS-6294 steel, case hardened to 81-84 Rockwell A, and has a .010" of stock removed from each side and bottom of the grooves. Plunge grinding these grooves with a multi-ribbed wheel is accomplished in one-sixth the time it takes to grind them with a single point wheel.

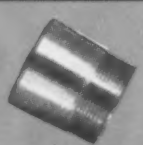
GOVERNOR PISTON

This piston, 1.591" long, is chrome-molybdenum steel 26-36 Rockwell C. Plunge grinding takes .005" from the outside of four shoulders leaving sharp corners. Production rate by plunge grinding is ten times as fast as it is by older methods.

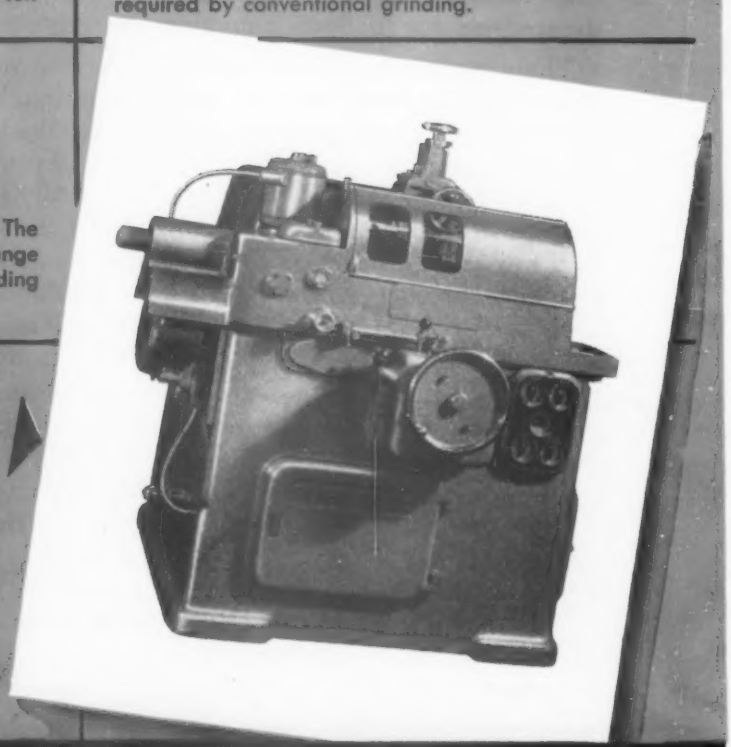
PROPELLER STUD

This stud is chrome-molybdenum steel 32-36 Rockwell C. The threaded section, 1 1/16" long (⅞"—20NF-3), is plunge ground in one-third the time required by conventional grinding.

SLEEVE



This sleeve is SAE-1015 steel 25-30 Rockwell C. The threaded section, ½" long (1⅜"—18N-3), is plunge ground in one-quarter the time required by grinding with a single point wheel.



All the parts shown here have been processed on the Sheffield Precision Thread and Form Grinder under normal operating conditions.

This machine, using a crusher dressed multi-ribbed wheel, plunge grinds single- or multi-start threads, eliminating thick first and last threads. It plunge grinds forms of almost any contour. It is also used to traverse grind single- or multi-start threads with a multi-ribbed wheel or it may be used with the conventional diamond dressed single point wheel.

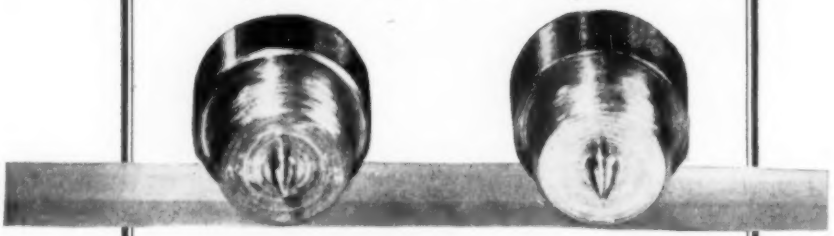
Write for complete story on crusher roll wheel dressing and plunge grinding—Bulletin M-100-144.

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

before and after



How the right cutting fluid pays

FIRING PINS or cylinder barrels . . . shells or ship shafts . . . plants that make them use cutting fluids—most often *good* cutting fluids. Often, however, one cutting fluid is expected to fit every job. Usually it won't, for when the operation—speed, feed, tools or stock are changed a new set of conditions exist. That means the cutting fluid factor must be considered carefully on every job—and the *right* fluid determined for it. Such consideration pays well.

The stainless steel parts illustrated above are a good example. It is obvious from these unretouched illustrations that the piece on the right has the better finish on both face and thread. This improvement over the left hand piece was due solely to a change in cutting oil to the *right* oil for the job. And this *right* oil proved to cost 14c per gal. less, on the machine. In this case a simple blend of Stuart's Thred Kut 99 was the answer—but it might have been any other of several Stuart Products.

Are You Having Troubles . . . in drilling hard steels . . . machining aluminum . . . high speed turning, reaming, boring, or milling? Chances are, Solvol Liquid Cutting Compound will help. Write for further information.

The important fact is found in the experience and specialization of Stuart Oil Engineering in applying proved products . . . in helping you find the *right* cutting fluid with the least trouble and cost to you. Let a Stuart Oil Engineer work with you.

D.A. Stuart Oil co.

LIMITED

2753 SOUTH TROY STREET, CHICAGO 23, ILL.

ESTABLISHED 1865

Warehouses in Principal Metal-Working Centers

INDUSTRIAL NEWS DIGEST

(Continued from page 116)

The new American War Standard covers coarse and fine threads, straight pipe threads and special threads. It is intended solely as an emergency measure and not as an addition to the American Standards already established.

The new standard may be obtained for 50 cents per copy from the American Standards Association, 29 West 39th Street, New York 18, N. Y.

Record Reservations Indicate Outstanding Metal Congress

CLEVELAND—Breaking a 26-year record for advance reservations of space, some 300 manufacturers and organizations serving the metal-working industry are scheduled to participate in the War Conference Displays and National Metal Congress. The event is scheduled for the week of October 16 in Cleveland's Public Hall.

"These heavy advance reservations reflect the cooperative spirit of the metal industry and its desire to come to grips with the problems that lie ahead," according to W. H. Eisenman, Managing Director of the Congress and National Secretary of the American Society for Metals, one of the five technical societies participating in the event.

Pointing out that some sections of the metal industry may be converting at least part of their production to civilian markets in the near future, Eisenman said, "These companies must get re-acquainted with the new executives, engineers and production men who occupy important positions in their field today. And on the other hand, these men must be familiar with what industry has to offer. Nowhere outside the Metal Congress is there a common meeting place where this huge cross-section of the metal industry can get together."

The Congress is sponsored by the American Society for Metals, in cooperation with the American Welding Society, the Iron and Steel and Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, the American Industrial Radium and X-Ray Society and the Society for Experimental Stress Analysis.

At technical sessions during the Congress, it is said, nearly 1,000 metal experts will collaborate in presenting some 150 lectures. In addition to the technical reports on research developments of the past year, the ASM will present a series of practical panel-type production meetings twice daily.

MATERIALS

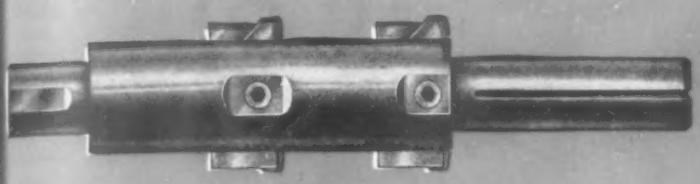
New Specifications for Alloy Steels Announced by SAE

NEW YORK—A tentative uniform method of specifying alloy steels by hardenability to expedite wartime manufacture and to conserve critical materials by facilitating selection and processing of steels on the basis of physical characteristics rather than chemical composition has been devel-

(Continued on page 120)

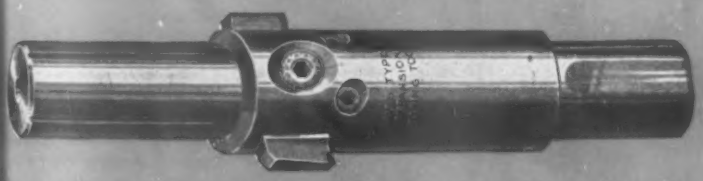
Davis Boring Tools

SET NEW RECORDS FOR ACCURACY & ECONOMY!

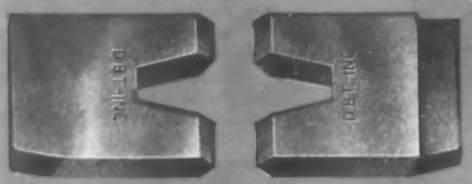


DAVIS BLOCK TYPE BORING TOOL

DAVIS REGULAR TYPE BLOCK



DAVIS EXPANSION TYPE BORING TOOL



DAVIS "L" TYPE BORING TOOL CUTTERS

Here Are Five Reasons Why-

1 **Accuracy:** Tools are precision built, assuring extremely accurate results.

2 **Interchangeability:** Uniformity of design and structure of blocks and cutters allow a rapid and accurate change of set-up.

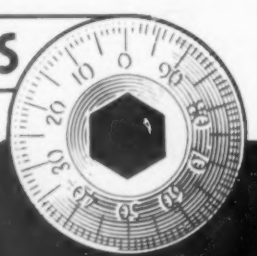
3 **Rugged Construction:** The rigidity and simplicity of Davis construction produces stronger tools, allowing with safety increased speeds and feeds.

4 **Economical:** Wide ranges of bores accomplished with a single tool. Cutters are all adjustable to compensate for wear and regrinding.

5 **Universal in Application:** Wide range of work; all boring and reaming operations handled with unusual success in every industry.

Write Today for Illustrated, Descriptive Bulletins.

DAVIS BORING TOOLS



DAVIS BORING TOOL DIV., Larkin Packer Company, Inc.

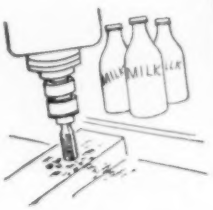
ST. LOUIS 14, U. S. A.

TAPPING TIPS*

From Woody Spencer's Notebook

For Copper, Skim Milk!

Skim Milk — for tapping Copper! Sounds screwy? Well, it sounded that way to me too when I first heard about it. And when I suggested it to some of the boys, all I got was a "Bronx Cheer." But I saw it work, and I never saw a smoother job . . . no tear, no crumble. Since then I've known of a lot of copper jobs that went mighty smooth with "barnyard" lubricant. Next time you have a copper tapping job, try it.



"Tapping Tips" are no cure-all for all tapping problems. They're just intended to be helpful, perhaps to save a little time or smooth out some of the run-of-mine tapping jobs.

For a real tapping problem, we urge, "get a specific engineering recommendation." Send us complete details of your operation, (material, diameter, depths and all the facts we should know). Our engineers will then be glad to make definite suggestions to cover your problem.

**Note: Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Watch for them.*

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company
Cleveland 3, Ohio

(Continued from page 118)

oped jointly by the Society of Automotive Engineers and the American Iron & Steel Institute.

The hardenability data are presented in a booklet, "Tentative Hardenability Bands," prepared cooperatively by the Iron & Steel Division, SAE Standards Committee; Iron & Steel Committee, SAE War Engineering Board and the Technical Committee on Alloy Steels, AISI.

The uniform method currently is applicable only to 37 standard fine grain steels of modified chemistries for which tentative hardenability bands have been published. The steels, identified by customary SAE and AISI numbers, plus the code letter "H", include 4100H from .30 to .50 carbon inclusive; 4340H; 4620H and the 8600H and 8700H series from .20 to .50 carbon inclusive.

For other standard steels minimum hardenability requirements consistent with minimum chemical compositions are being prepared. These will apply until sufficient SAE standard end-quench hardenability test data for full bands become available from studies now under way.

The new method which it is believed will become widely used in metal-working industries, springs from an engineering philosophy of selecting steels on the basis of hardenability as an index of tensile strength, with only coral-lary reference to compositions.

AIRCRAFT PRODUCTION

Trimming of 1944 Schedules Hits B-24 Bomber Jobs

● With cutbacks hitting many war production jobs, the axe that fell on the aircraft industry last month was not wholly unexpected. When see-sawing production schedules were finally pinned down, the WPB's Production Executive Committee announced August 11, a reduction of three per cent in overall aircraft goals for the year.

Aircraft sights were lowered to an objective of slightly more than 100,000 planes for 1944, by trimming schedules approximately three per cent during the next five months.

This cutback will bring production to about 8,274 planes monthly for the remainder of the year—far lower than the 9,118 ships delivered in March, but higher than the July figure of exactly 8,000. July output was 449 planes behind schedule and 49 planes off the June output.

Though Ex-WPB Executive Vice Chairman Charles E. Wilson said the cutback would cause no unemployment, the War Department estimated that it would effect "the immediate release of some 20,000 aircraft workers and the gradual release of an additional 100,000 during the balance of the year."

The adjustment in production goals reflects the Army's demand for more of the larger-type ships—B-29s and B-32s—and fewer trainers, fighters, and short-range bombers. This change in

(Continued on page 122)

THE lathes in your shop may be only a few years old—yet may be as worn or obsolete as machines of half a century ago. For in many shops today, the terrific strain of continuous war production has reduced the economic life of a lathe to a fraction of its original capacity. With greater production still the objective in nearly every plant, lathes incapable of top performance should be replaced with new and improved models.

If the lathes in your shop were purchased before the war, check them with the new, more versatile and productive lathes Lodge & Shipley offers. These powerful, high-efficiency tools will give your work the benefit of every worthwhile improvement devised in 52 years of specialized lathe experience. For a practical demonstration of how an L & S Lathe pays for itself in increased production and lowered costs, call on Lodge & Shipley Engineers.

PREPARE FOR THE COMING BATTLE OF MARKETS!

In the postwar period, lower costs will be more than ever a determining factor in the salability of your products. This L & S Manufacturing Lathe, for example, will reduce your production costs on a wide variety of work. In addition to having all the features of an engine lathe, it performs many other types of work, rivals an automatic in output and accuracy. Various automatic and manual controls simplify tasks of the operator, effecting unusual time savings on both production and single-piece jobs. For complete details on various L & S Manufacturing Lathes write for Bulletin No. 615 MO.

ENGINE
AUTOMATIC
TOOL ROOM
OIL COUNTRY
LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

FROM THE FILES OF "AMERICAN SWISS" FILE SERVICE

"We find AMERICAN SWISS Swiss-Pattern Files more accurate for shape and longer lived than any other files we have tried. We are daily saving money through their use."
From an accessories manufacturer

True shape . . . long life . . . money savings . . . no wonder this manufacturer, like thousands of others all over the country, has standardized on "AMERICAN SWISS" — the Swiss-Pattern files with these important advantages.

Wherever accurate or intricate filing is to be done, these precision tools assure best results in least time and at lowest cost. Their invariable uniformity is assured by heat treatment, automatically controlled to within ± 5° F.; and by sizing with close tolerance . . . ± .002 in. in some shapes. A rigid inspection system weeds out and immediately **destroys** all imperfect files, so that you can be sure of only top-notch perfection in every file with the "AMERICAN SWISS" name and trademark. You are SAFE when you buy any of the 3000 different types and sizes of "AMERICAN SWISS" Files . . . obtainable from our Distributor.

WRITE FOR CATALOG

American Swiss File & Tool Co., Elizabeth, N. J.

ASK FOR THEM BY NAME

American Swiss ★ ★

SWISS PATTERN FILES

(Continued from page 120)

fighting-front requirements first became apparent when the total number of ships produced began to fall in April, while total weight of planes continued to rise.

Most important immediate reduction is in the production schedules of the C-46 Cargo type ship, it was announced. Higgins Aircraft in New Orleans will not commence the production of this type plane as originally planned.

Curtiss-Wright at St. Louis, where parts are produced, and at Louisville, where C-46s are assembled, will work toward a production schedule of 50 aircraft monthly instead of a previous 108 monthly. Curtiss-Wright at Buffalo will not be hit, will work toward a production schedule of 150 monthly.

The other important production change involves the Liberator B-24, which is being replaced in considerable part by the heavier B-29 and B-32. The plant affected most is North American at Dallas, where production of the B-24 is being terminated. However, Southern California aircraft manufacturers are being required to place subcontracts in the Dallas plant to relieve the labor shortage that still exists on the coast.

B-24 cutbacks, beside affecting Consolidated-Vultee in San Diego, hit Ford's Willow Run. The reduction in over-all schedules at these two plants will be from 26 to 14 per day, the rate to depend upon the rapidity with which Consolidated can get into production of the new, heavier B-32s.

In Detroit, Ford officials hastened to announce that Willow Run's plane-an-hour rate would not be impaired, that output there would not drop more than two planes per day. Army and WPB men thought the auto builder was unduly optimistic.

INDUSTRIAL BUSINESS NOTES

News of Industry Expansions, Services, and Activities

New Representative: Charles F. Staples, Staple Engineering Company, is now sales and engineering representative in the Michigan territory for Davis Boring Tool. The Staple organization, Birmingham, Michigan, also produces honing equipment and is engaged in production honing work.

* *

Acquisition: In the most newsworthy mid-summer industrial business development in New England, negotiations were completed July 1, for the purchase of the Electrical Division of Colt's Patent Fire Arms Manufacturing Company by Federal Electric Products Company, Newark, New Jersey.

Louis W. Cole, Federal President, stressed the fact that the manufacture of motor controls and other Colt products would be continued at Hartford, Connecticut, with the same personnel, but under the supervision of Thomas M. Cole, Executive Vice-President of Federal.

* *

Representative: The Eastern Machine Screw Corporation, New Haven, Connecticut, manufacturers of insert

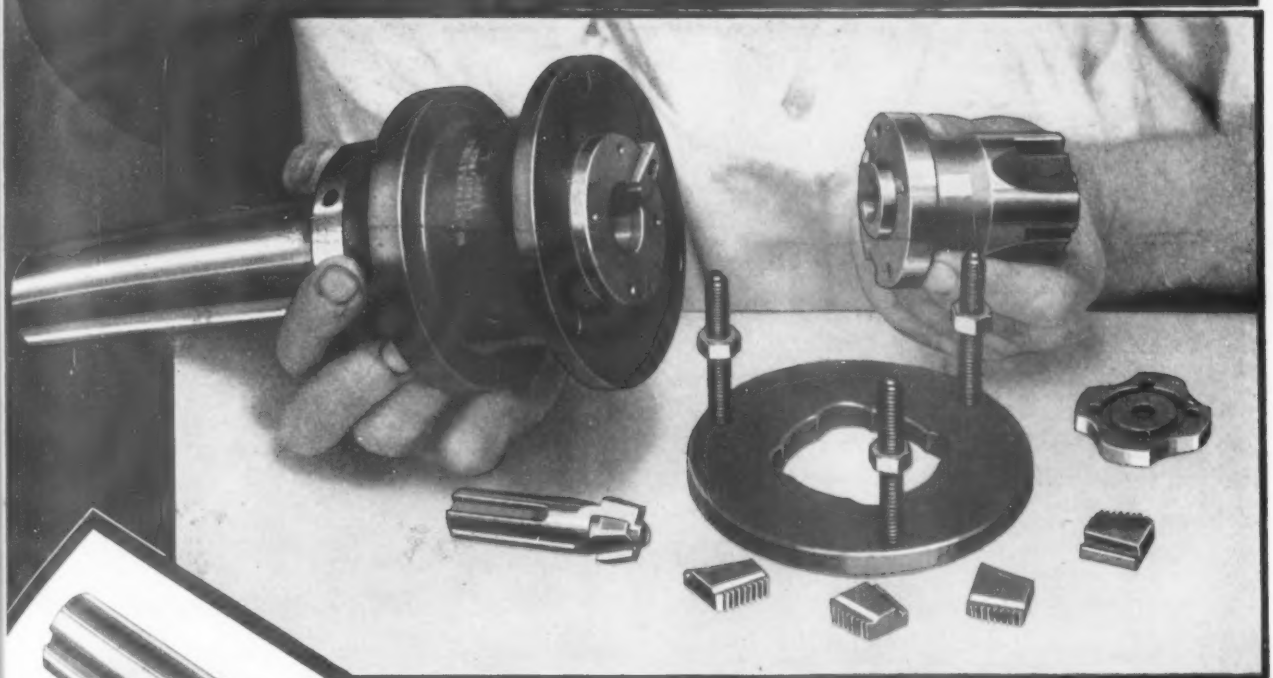
(Continued on page 126)

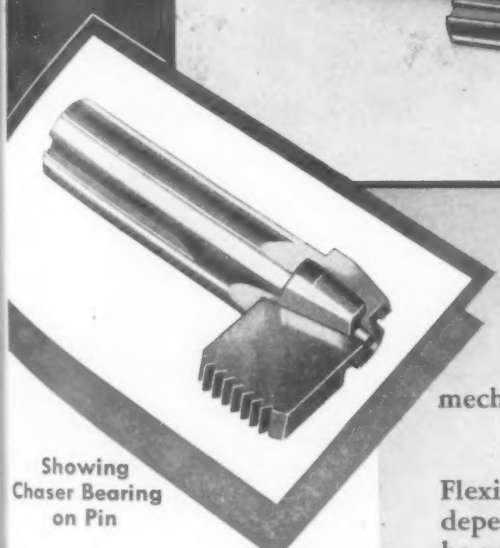
Announcing

THE NEWEST ACHIEVEMENT BY *Murchey*

15 Threading Sizes in Only 2 Tools

TYPE L COLLAPSIBLE MACHINE TAP





Showing Chaser Bearing on Pin

Murchey also manufactures all types of Collapsible Taps, Self Opening Die Heads and Tapping Machines. Write for literature on any of these products.

NEW MECHANICAL FEATURES

Separate nose pieces and two bodies provide threading ranges of 1⅛" to 6" in diameter. 15 sizes in all —8 for smaller—7 for larger. Simplified design. Single centralized spring. Fewer pieces. Chasers mechanically stronger. Bearing surface 100% on the pin.

ADVANTAGES OF TYPE L

Flexibility. Better alignment—straighter threads. Greater dependability—trouble-free performance . . . longer life. Can be used on machines with or without lead screws. Tripping mechanism may be operated from face of the work or by the use of a yoke. All exposed surfaces treated with penetrating rust-proofing process.

Write for Complete Information to Dept. T

MURCHEY MACHINE & TOOL CO.
DETROIT 26, MICHIGAN

MURCHEY

PROGRESSIVE PLANTS HAVE

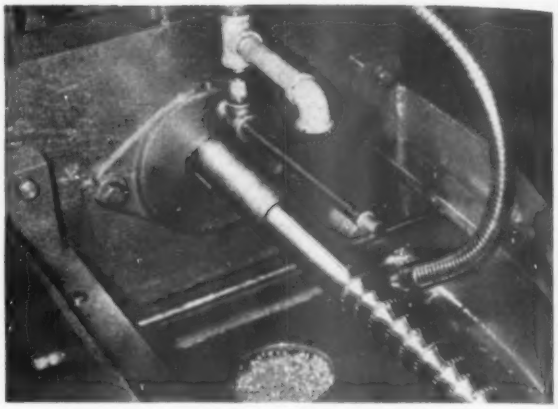
Changed to Broaching

for **GREATER ACCURACY**

Scrap was reduced 97% when gun barrel rifling was changed over to broaching.

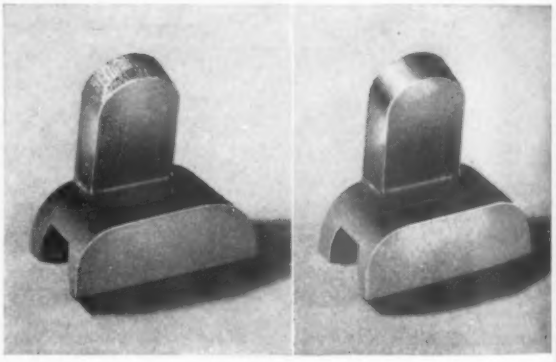
GREATER SPEED

Switching this hydraulic cylinder from boring to broaching cut production time 48½ minutes on one operation alone.



FINER FINISH

The radius on the end of the tongue had been formed by a shaving die. Changing to broaching improved finish and accuracy and entirely eliminated breaking out of the tip under die pressure.



The modern manufacturer cannot afford to overlook the possibilities of broaching. It will cost you nothing to find out how broaching can improve production in *your* plant. Get in touch with the nearest Detroit Broach representative or with either plant and a competent engineer will be glad to give you complete cost and production data without obligation.

BROACHING TOOL

ARMY E NAVY

DETROIT BROACH COMPANY

20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

9308 SANTA MONICA BLVD. • BEVERLY HILLS, CALIFORNIA

EASIER TO OPERATE . . .

Many functions are automatic

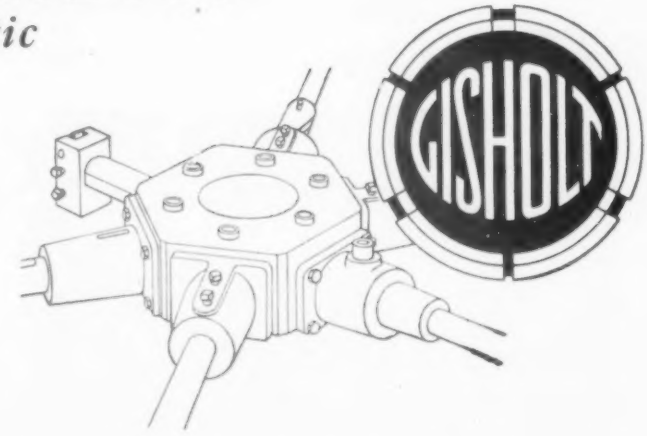
EVERYTHING about these modern Gisholt Ram Type Turret Lathes has been simplified to make them easier to operate . . . to eliminate waste time . . . to reduce fatigue . . . to speed up production.

Such advantages as automatic spindle-braking, automatic indexing and clamping of the hexagon turret, and selective automatic speed changing relieve the operator of many motions and cut the lag in machining time.

We couldn't, in one short advertisement, begin to enumerate all of the time and effort-saving refinements which have been perfected through 60 years of building and using Gisholt Turret Lathes. But they are facts that you should know—for faster, easier production *now*, and in the years ahead.

Ask a Gisholt engineer to tell you about them. Or write for descriptive literature.

GISHOLT MACHINE COMPANY
1229 *East Washington Avenue • Madison 3, Wisconsin*



Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

When you change over to civilian products—here's how EUREKA Tool Steel Welding Electrodes will help you save time, material and avoid production delays.

1. **You can repair existing die units to keep them in operation with a minimum of "down-time".**
2. **Changes can be made during die "try-out" periods by correcting design, rectifying errors, etc.**
3. **During die "change-over" contours, corners and edges of your old dies can be welded to adapt them to change in design.**
4. **Die units can be compositely fabricated by welding with desired tool steel electrodes, on mild or medium carbon steel, to form cutting edges or working areas.**

Space does not permit detailed information here—so write us today for descriptive literature.

Distributors in principal cities of U.S.A. and Canada

EUREKA STEEL ELECTRODES NOW FIND THE WORK

Welding Equipment & Supply Co.

WELDING ENGINEERS WITH A COMPLETE SERVICE

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN

IT'S FREE!

Your plant personnel will want to see this sound slide film. It is the only completely compiled technical information available anywhere on the advantages of and proper procedure for application in Metallic Arc Tool Steel Welding. Write for a free showing today!

(Continued from page 122)

chaser die heads, threading machines and other metal-working products, have appointed F. F. Barber Machinery Company as Canadian representatives with offices in Toronto, Windsor and Montreal.

* *

Tool Plant Moves: Both offices and manufacturing plant of Sutton Tool Company have been moved from Detroit to Sturgis, Michigan. In conjunction with the move and a revised corporate setup, a plant expansion is expected to provide better facilities for production of diamond grip collets, feed fingers and super feeders. Formal announcement of the change was made by Guy Laughlin, new Sutton President. E. M. Moore has been named Secretary-Treasurer, and G. S. Glending is Advertising Manager. C. M. Sutton, former owner, continues as a Director and will represent the Company in the Detroit territory.

* *

Stainless Steels: According to an announcement by The Timken Roller Bearing Company, Canton, Ohio, Brace-Mueller-Huntley have been appointed representatives for Timken Stainless Steels.

The Stainless Steels will be available for direct shipment from the new representative's warehouses in Buffalo, Syracuse and Rochester, New York, and in Montreal and Toronto, Canada. Timken's Stainless Steel Tubing will be available through Brace-Mueller-Huntley for direct mill shipment.

* *

Building Moved: The removal of a building from New Castle, Delaware, to serve as an addition to the plants of the Titan Metal Manufacturing Company, Bellefonte, Pennsylvania, has been revealed by W. W. Sieg, Titan General Manager. The addition is part of a $1,500,000 expansion project financed by DPC, and includes the building and equipping of a new melting, extruding and cold-finishing brass mill. Between 100 and 200 additional employees will be added, it was said.

* *

J and L Purchase: Jones & Laughlin Steel Corporation have announced that its subsidiary, J & L Steel Barrel Company, has purchased the Draper Manufacturing Company, Cleveland. Draper, the oldest manufacturer of steel barrels in the United States, will be operated as The Draper Division of the J & L Steel Barrel Company, under the present managing personnel.

* *

New Norton Territory: Norton Company, Worcester, Massachusetts, has formed a new sales territory to be known as the West Central Rocky Mountain District. It will be under the supervision of Ralph O. Anderson, District Manager, with headquarters in Denver. Anderson has been associated with Norton for more than 30 years. Kansas City, Houston and Dallas offices will report to the new Colorado Capital office.

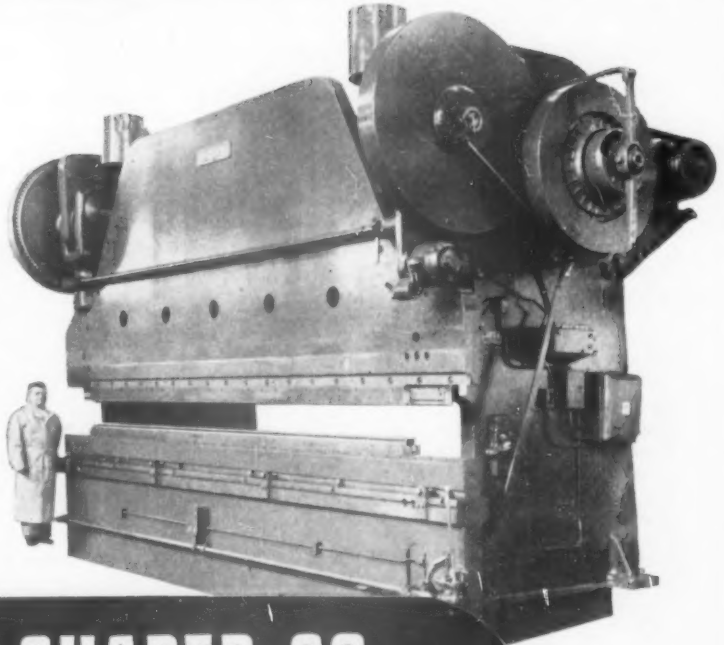
* *

Absorbed: The business of the New England Drawn Steel Company, Mansfield, Massachusetts, has been taken over by Bliss & Laughlin, Incorpor-

(Continued on page 129)

Stiffeners for Navy pontoons are formed rapidly and of equal importance accurately —3 bends in one hit. Removable angle brackets on the bed and ram give the wide die surface required for this type of job. This is just another example of the wide versatility of Cincinnati Press Brakes.

Consult our Engineering Department on your job or write for Catalog B-2, showing many applications of Cincinnati Press Brakes.



THE CINCINNATI SHAPER CO.

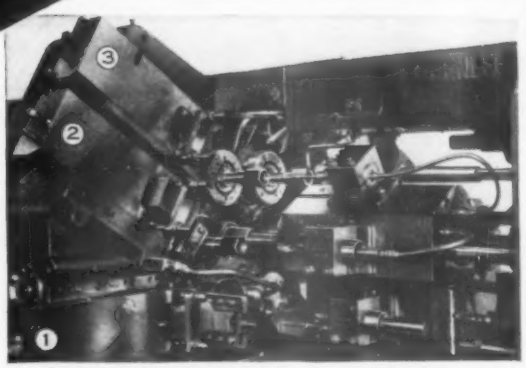
CINCINNATI OHIO U.S.A.

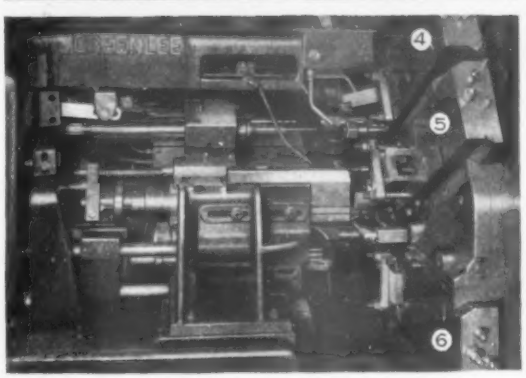
SHAPERS · SHEARS · BRAKES

INCENDIARY BOMB NOSE COMPLETED
On 2" Greenlee 6-Spindle Automatics

BATAVIA METAL PRODUCTS CO. HAS STREAMLINED SET-UP

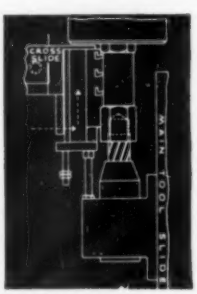
An up-to-the-minute screw machine department, complete in itself . . . inspection booth, tool room, packaging and shipping space, neatly arranged around a battery of 10 Greenlee 6-Spindle Automatics. . . saves time and speeds production of vital war parts at Batavia Metal Products Company, Batavia, Illinois. A unique inspection system, with red stop lights for each machine, affords quick control over operations. A conveyor belt, installed in front of machine line, transfers completed parts to inspection booth at rear. The Greenlees, of 2" capacity, *complete* the chemical warfare bomb nose part in fourteen operations from 1-21/32" S.A.E. X-1113 hex. stock at gross rate of 39 seconds per piece.





FORM-TURNING ATTACHMENT SIMPLIFIES PROCESSING

Greenlee form-turning attachment avoids wide plunge cutting of stock. As illustrated, cross-slide feeds narrow tools to depth. Main tool-slide then contacts attachment, turning a uniform diameter lengthwise on piece. This Greenlee feature, also offers unusual production advantages on many other parts — may be used in five positions. *Write today for more facts on Greenlee Automatics.*



TOOLING DATA — Photos above show tooling set-up used to produce chemical warfare incendiary bomb nose. Operations are outlined below:

1. Form-turn hex. Drill 1" hole and counterbore for 1¼" tap.
2. Rough form small O. D. Finish drill 1" hole and chamfer.
3. Finish form large O. D. Drill small hole — partial depth.
4. Finish form small O. D. and face to length. Finish drill small hole with high speed attachment.
5. Groove outer diameters. Ream holes with geared reaming attachment.
6. Tap. Cut-off.

GREENLEE BROS. & CO. 1949 Mason Ave., Rockford, Illinois

GREENLEE

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

(Continued from page 126)

ated. It is now being operated as The New England Drawn Steel Division, Bliss & Laughlin, under the direction of Harold L. Sherwin, who will continue as General Manager. Walter R. Howell, B & L President, Harvey, Illinois, made the announcement.

* *

Mec-Rad Expands: Franklin G. Gepfert, Chairman of the Board, Black Industries, has announced that the Mec-Rad Division of this concern is erecting a new building adjacent to the present plant in Cleveland, to be devoted to the manufacture of mechanical and electrical components for Radionics. John Altmayer is General Manager of the Mec-Rad Division.

* *

Division Formed: Wall-Colmonoy Corporation, Detroit, manufacturers of hard-facing alloys and overlay metals, has revealed the formation of a Machine Tool Welding Division. The new division will handle the corporation's custom and contract welding, including applications of center tips, centerless grinder rest blades, gage parts, valves and valve seats.

* *

New Distributor: Hufford Machine Works, Incorporated, Redondo, California, has appointed Moore Machinery Company as exclusive distributor in California, Arizona and Nevada for its stretch-forming machine and portable hydraulic elevator.

* *

War Jobs: The Navy has selected the Lawrence Aeronautical Corporation, Linden, New Jersey, the company states, to manufacture two different types of automatic pilots. Lawrence already has completed several Government production contracts. Rowland Burnstan, President, says that Lawrence has contracts to do research work for other Government agencies.

* *

Sales Manager: Rolled Thread Die Company, Worcester, Massachusetts, has appointed George F. Getschman, Fisher Building, Detroit, District Sales Manager for Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri and Northwest Ohio. Before joining the New England firm 20 years ago, Getschman was employed in the inspection department of the Hudson Motor Car Company.

* *

American Can: Come the end of the war and St. Louis can boast of a substantial addition to its growing industrial background. The postwar plans of the American Can Company call for establishment of one of the company's largest manufacturing units there according to D. W. Figgis, president of the concern.

The new plant, originally intended for can manufacture but made available to the Government for torpedo production during the war, will have more than 600,000 square feet of floor space, will employ about 750 workers. An older St. Louis plant, now in operation but which has only about one-sixth of the new plant's capacity, will be abandoned after the war, and the production personnel absorbed by the new unit.

(Concluded on page 132)

Faster CHECKING and STRAIGHTENING *at Less Cost!*

HYDRAULIC POWER PRESS

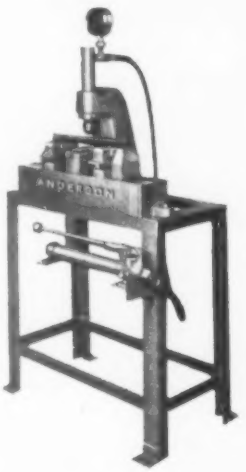
MODEL HP-010-P

Built with Stationary or Traveling Ram . . . capacities up to 10 and 25 tons . . . so sensitive and accurate that a shaft may be bent .001". Pressure gauge, indicating ram loading . . . adjustable dial indicator shows amount of shaft run-out in pre-loaded, fully loaded, and unloaded positions.

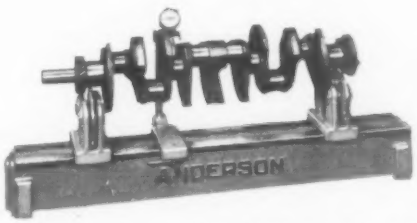
Flexible, sensitive control by rotary control valve operated by hand lever. An infinite range of loading up to capacity as lever is moved from 0 to maximum displacement. Push button control of hydraulic unit. Work table, 60" or 108" long. Available attachments include checking rolls, spring loaded centers, adjustable anvils and indicator. To increase production speed, an adjustable stop collar limits the stroke of the ram.

HYDRAULIC HAND PRESS

MODEL HP-010



Checking and bending performed in same position without moving shaft from anvils to centers. When pressure is released spring tension on rolls or centers brings shaft free of anvils and free to rotate for checking. Checking rolls easily adjusted for various shaft lengths. Equipped with indicator gauge calibrated in thousands for locating high and low spots on shaft. Also a pressure gauge calibrated in pounds. Exact tonnage required to straighten any shaft quickly determined. Operated by hand hydraulic pump with capacities of 10, 20 and 50 tons.



ROTO CHECKER

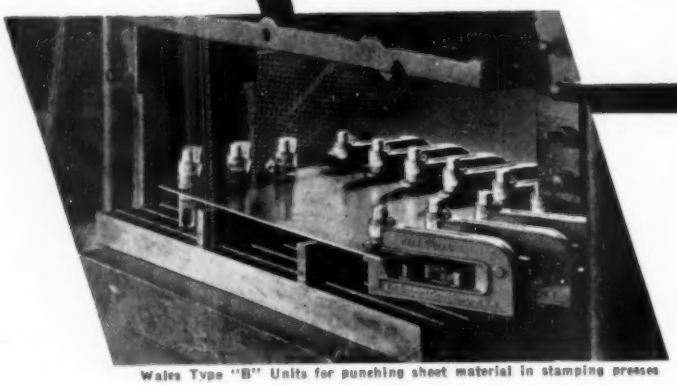
A fast operating device for checking straight shafting, tubing and pieces having the same diameter at both ends. Work is mounted directly on discs which rotate in supersensitive ball bearings. Time customarily used for cleaning and conditioning centers is saved, also the time for mounting between centers. Balancing is also handled by this machine. Base is of rugged construction, well ribbed and scraped to precision. Dial indicator graduated in thousandths.

BUY MORE BONDS

ANDERSON BROS. MFG. CO.
Anderson
ROCKFORD, ILL. U.S.A.

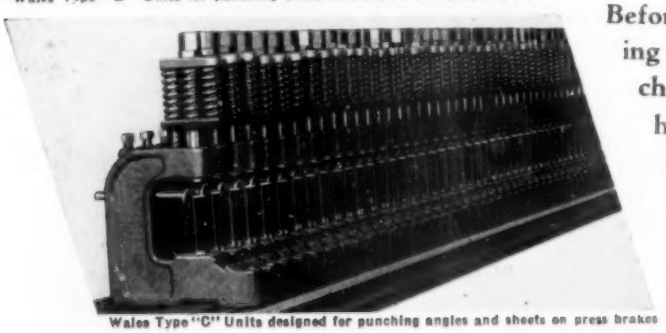
WRITE FOR BULLETIN 910

BEFORE YOU PUT HOLES IN
SHEETS
ANGLES
CHANNELS



Wales Type "B" Units for punching sheet material in stamping presses

BY *any* METHOD . . . *investigate*
WALES
HOLE PUNCHING EQUIPMENT



Wales Type "C" Units designed for punching angles and sheets on press brakes

Before spending valuable time and effort designing and building special hole punching dies, check with Wales-Strippit engineers who may have solved your particular hole punching problems by using various adaptations of standard Wales Hole Punching Units.

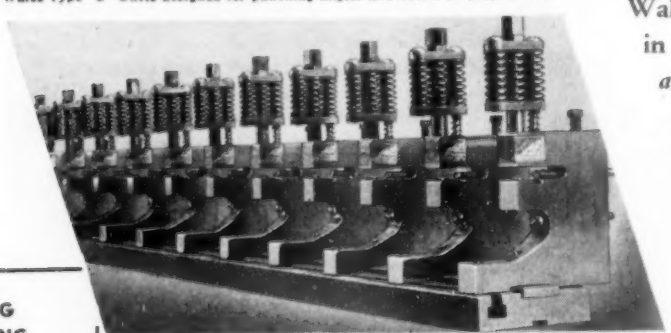
Join the hundreds of metal fabricators who make it a rule to call on Wales-Strippit *before* putting holes in sheets, channels, and angles *by any method*.

As a timely suggestion, call on Wales-Strippit *FIRST*.

●

Write for Catalogs

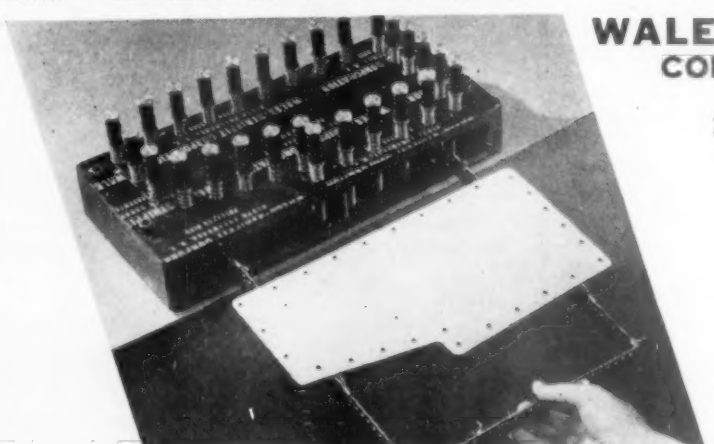
●



Wales Type "E" Units to punch extruded shapes and channels on press brakes

TIME-SAVING MONEY-SAVING FEATURES

1. Usual time-consuming adjustments of conventional set-ups are eliminated
2. Punch and die held in perfect alignment by holder
3. Each unit is independent and self-contained
4. Straight line, staggered or scattered patterns, punched with same units
5. Same group of units may be used interchangeably on press brakes and stamping presses
6. Nothing attached to press ram
7. Individual units may be instantly removed or reset
8. Punches may be interchanged without disturbing set-up
9. Die setting and press "down time" reduced to minutes
10. Same units may be used and re-used in unlimited patterns



Wales Plate Set System punches holes in sheets as close as 1/8" center-to-center in any direction over the entire sheet

WALES-STRIPPIT CORPORATION

353 Payne Avenue

NORTH TONAWANDA N. Y.

(Between Buffalo and Niagara Falls)

GEORGE F. WALES, President

Specialists in Punching and Notching Equipment

Baker *Self-contained, Hydraulic Feed*

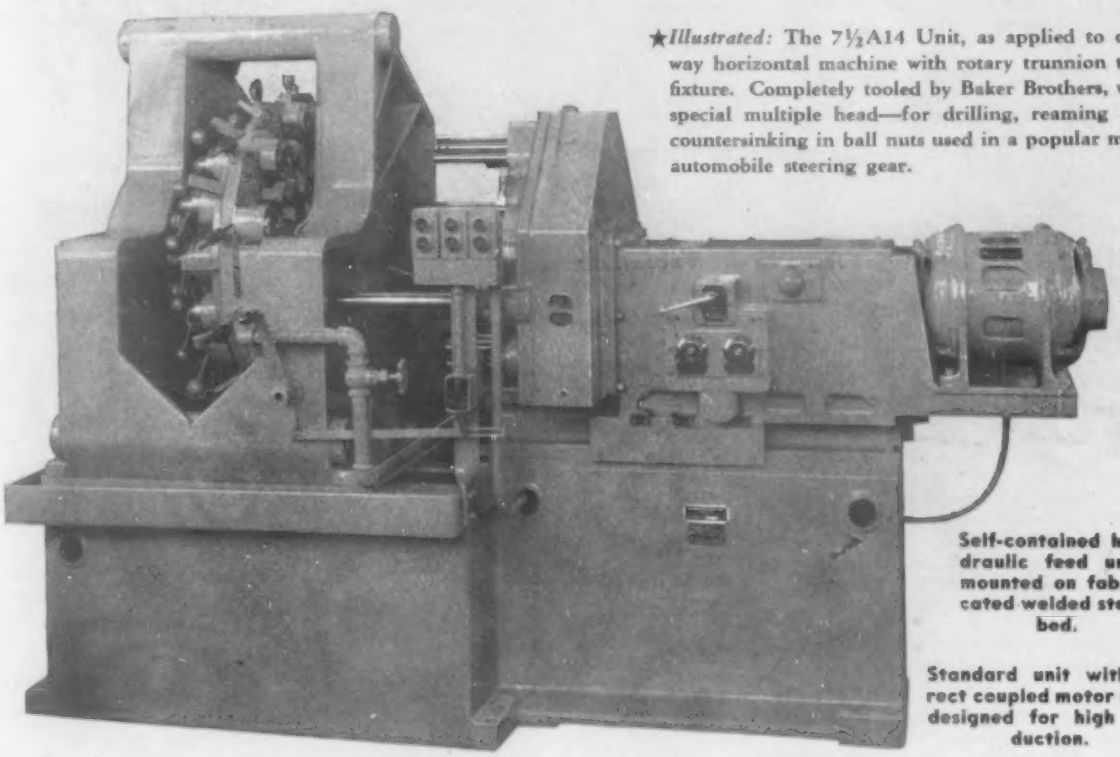
DRILLING UNITS

MODELS 5A12 and 7½A14

ADAPTED TO SINGLE-SPINDLE AND MULTIPLE-SPINDLE DRILLING, BORING, REAMING, COUNTERBORING, HOLLOW MILLING, CHAMFERING AND FACING OPERATIONS

COMPACT AND FLEXIBLE IN DESIGN

READILY SUITABLE TO RETOOL — A TYPE OF UNIT MACHINE THAT SERVES WELL FOR WAR OPERATIONS, AND CAN BE USED TO ADVANTAGE ON AUTOMOBILE PRODUCTION, ETC. • THIS BAKER DESIGN SHOULD BE ESPECIALLY INTERESTING TO THOSE ENGINEERS WHO ARE MAKING POSTWAR PLANS



★*Illustrated:* The 7½A14 Unit, as applied to one-way horizontal machine with rotary trunnion type fixture. Completely tooled by Baker Brothers, with special multiple head—for drilling, reaming and countersinking in ball nuts used in a popular make automobile steering gear.

Self-contained hydraulic feed unit mounted on fabricated welded steel bed.

Standard unit with direct coupled motor drive designed for high production.

★Machine as shown is furnished with hand index trunnion fixture, allowing for loading and unloading part while operations are being performed. Trunnion type fixtures also available with automatic power index. Baker Brothers are in position to supply this unit-type equipment as either two-way, three-way, or four-way.

★The unit can be ordered to be arranged at angles. Many special features, such as feeding cycle with positive stop and delayed reverse, jump feed cycle attachment, and speed change pick-off gears (for lower production requirements), are fully described in our literature, which will be gladly sent upon request.

Baker Brothers, Inc. Toledo, 10, Ohio

MACHINES FOR DRILLING • BORING • TAPPING • CONTOUR GRINDING

(Concluded from page 129)

MOTOR MEMOS

Fishers quit General Motors in dramatic move. Expanded Graham-Paige setup prepares for postwar. Packard reveals peacetime plans.

Industry Repairs Corporate and Postwar Product Fences

DETROIT—The automobile industry, as represented by plants here and in several dozen other cities across the nation, has reached the crossroads. With its labor beset by a severe case of cutback jitters and its management scrambling to repair corporate and product fences in preparation for reconversion, the overall picture is one of general confusion.

A neophyte newsman, in from the sticks to cover the motor capital for the first time, last month might well have lost his sense of proportions. The flood of stories—publicity and straight news—was reminiscent of the prewar days when saleswise motor makers sent their public relations men out to peddle a story a day.

But beneath the smoke, Detroit's crafty, hard-headed management was at work on two jobs. Number One Job: Completion of the largest single war production program in the nation. Number Two Job: Final preparation for the task of piling auto production on top of Pacific offensive war work.

How near reconversion actually is, was indicated by a statement direct from WPB Boss Donald Nelson late in August, predicting a cut of roughly 40 per cent in war output when Hitler folds. The difference, he said, would actually permit full-scale civilian output at the 1939 level. In the auto industry, war-expanded plant capacity would make this possible.

Regarding interim unemployment here, Nelson shook his head. Recalling the dire and unfulfilled predictions about unemployment when auto plants converted to war, he said, "The auto industry is led by some of the very best management in the country—live, aggressive fellows who know what they are doing".

● **The Merry-Go-Round:** Biggest news of the month broke in the golden tower of Detroit's Fisher Building. High up in that gaudy structure, built with funds from one of America's largest single family fortunes, four men with 25 years' experience each in automobile building filed into one room. To the news-hungry press they announced that they, Lawrence, Alfred, William and Edward Fisher, were through with General Motors.

Why had they left? To go into business for themselves.

What will that business be? They said simply that it would be big, refused to answer any more questions.

Now, everyone in Detroit is guessing. The conventional greeting along motor-row is, "Have you heard anything on the Fishers?"

● **Graham-Paige:** This old name in motordom bounced back into the news early in August when the ex-Chrysler, ex-Willys-Overland executive, Joseph W. Frazer, completed a series of financial manipulations to gain control of the company through the purchase of 265,000 shares of stock at $2 each. Acquisition of a subsidiary, the $9,000,000 Warren City Manufacturing Company plant, was also announced by Board Chairman Frazer and his New York associates. What Graham-Paige postwar manufacturing plans might be was anybody's guess. Company President Raymond J. Hodgson said that news would come later.

POSTWAR JEEP COMING

NEW YORK — Auto news was made here August 22, when it was revealed that a contract to build bodies for a postwar Jeep model has been awarded The American Central Manufacturing Company, Connersville, Indiana, by Willys-Overland.

Production of 25,000 bodies is to start as soon as WPB releases materials. It is believed the peacetime Jeep will be made suitable for farm and utility use.

STUDEBAKER REVEALS THE "WEASEL"

SOUTH BEND — "The Weasel", new vehicle used in the European invasion that performs over the worst ground conditions, is now revealed by Studebaker Corporation.

The track-bearing conveyance, in secret production here for almost two years, is powered by a standard six-cylinder Studebaker engine. Pressure exerted on the ground by the unit is about one-fourth that of a fully equipped infantryman.

For first technical printed description of Weasel manufacture, see *Streamlined Production*, p. 83.

● **Ford:** Out at Dearborn, the pioneer motor maker busied himself celebrating his 81st birthday, grooming his grandson Henry II for the gap left in the management by the passing of the beloved Edsel Ford. In a birthday interview the elder Ford re-affirmed his determination to build a plastic body. Late in the month, the Ford organization turned over to the Army and the War Manpower Commission the nasty job of announcing that B-24 cutbacks would result in the layoff of 12,000 Willow Run workers by mid-December. In a dealership in Washington, D. C., strange as it may seem, the news leaked out that the public would be offered a postwar "Model A" Ford. Every Detroit reporter guessed in print about the projected car. None really knows the details. It may be a V-8, it may be a six—and it may have five cylinders.

Packard's Christopher reveals expansive postwar auto plans to fellow-workers.

● **Packard Plans:** If by nothing but the sheer weight of its dynamic president's personality, the little giant of the industry is hogging headlines. Packard Prexy George T. Christopher makes news without even trying. Last week, this farm boy with a monkey wrench made more news, revealing his company's postwar plans.

These plans, first announced to his 39,000 fellow-workers, include:

(1) A second American liquid-cooled aircraft engine, to compete with GM's Allison job. It will be produced at Toledo under the same roof with the new Packard engine research laboratory.

(2) Entry into the industrial engine field.

(3) Boosting passenger car output 63 per cent above prewar levels, employment 133 per cent. Production at the rate of 200,000 units annually within 18 months of reconversion is expected to cut prices $125 per unit below prewar levels.

Subcontracting, leasing 500,000 square feet of additional factory floor space and removal of some departments to rented space in Detroit and Cleveland will clear the decks for auto output. Briggs Manufacturing will get all Packard body work.

● **Chevrolet:** Starting from scratch in light metals fabrication, the auto industry has rolled up an impressive war record in this field. To date, four Chevrolet plants have produced a total of 113,750,000 pounds of aluminum forgings, ranging from engine parts to eight-foot propeller blades. The GM division is now the nation's second largest producer of such items.

When the big shell program developed this summer, Chevrolet was handed still another war job: An order for manufacture of 105-mm howitzer shells at St. Louis. Production, expected to begin in December, calls for a peak of $3,500,000 monthly by June.

Having produced more than 46,000 P&W 14-cylinder engines, Chevrolet is making a new 18-cylinder job.

THE END

HYDRAULIC BALANCE

CANCELS OUT BEARING LOADS

And Means MUCH LONGER PUMP LIFE

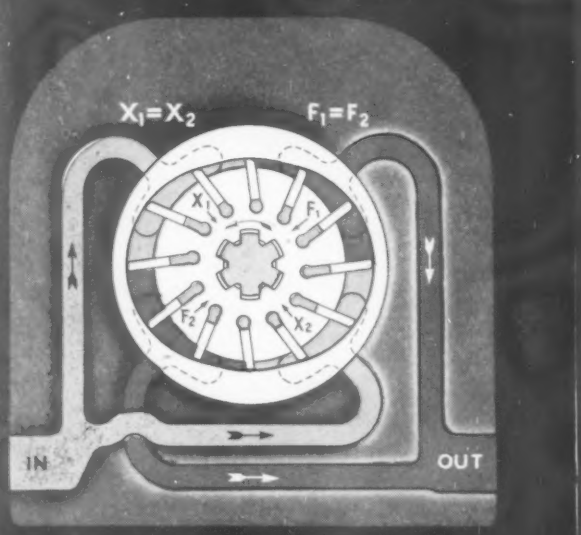


Diagram showing patented "Hydraulic Balance" construction.

VICKERS

Balanced

VANE TYPE PUMPS

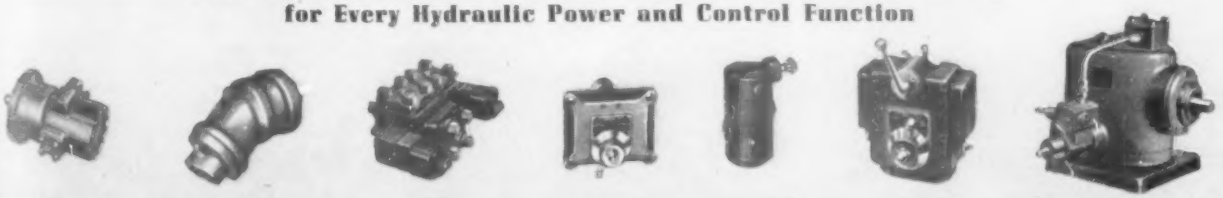
As illustrated by the diagram above, equal and opposing pressure areas are provided on the outlet side and on the inlet side of Vickers Balanced Vane Type Pumps. The equal and opposing radial hydraulic thrust loads cancel each other . . . consequently there are *no* bearing loads resulting from pressure. The major cause for wear is thus completely eliminated and the result is much longer pump life. This "Hydraulic Balance" construction is exclusive with Vickers Vane Type Pumps; it also permits an unusual design compactness and is an important reason for the exceptionally high efficiency of these pumps.

Vickers Balanced Vane Type Pumps are available in single-stage for 1000 psi (see Bulletin 40-25a); two-stage for 2000 psi (see Bulletin 40-16) and also two-pressure, large-small volume (see Bulletin 38-14). Vickers Application Engineers will gladly discuss with you the many different types of hydraulic power and control circuits on which these pumps have improved machine performance. Write the office nearest you.

VICKERS *Incorporated* • 1416 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO · CLEVELAND · DETROIT · LOS ANGELES · NEWARK · PHILADELPHIA · ROCHESTER · ROCKFORD · TULSA · WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



CONSTANT DELIVERY PUMPS | FLUID MOTORS | DIRECTIONAL CONTROLS | VOLUME CONTROLS | PRESSURE CONTROLS | CONTROL ASSEMBLIES | VARIABLE DELIVERY PUMPS

A.S.T.E. MAPS SYRACUSE MEETING

Society Seeks to Circulate Production Techniques

WIDEST possible circulation of tool engineering "know how" is the objective of the twelfth semi-annual meeting of the American Society of Tool Engineers, October 12, 13 and 14 at Syracuse, N. Y., according to President D. D. Burnside, St. Louis.

"Failure to hold the meeting this year would break the continuity of the effective meetings during the war period, when much valuable information has been presented at the technical sessions and carried to every part of the United States and Canada by word of mouth and through excellent technical journals," he said.

In announcing the conference, President Burnside said that the vital need for extending information concerning methods of producing more and better war materiel and developing more and better equipment capable of being operated efficiently by women and unskilled operators has caused the society's executive committee to decide that the meeting does not fall within the scope of "unnecessary conventions" as defined by the Office of Defense Transportation.

Each of 65 chapters expects to have at least two qualified delegates at the sessions, despite a policy against encouragement of large representation.

Headquarters will be the Syracuse Hotel. Program chairman is Ray H. Morris, Immediate Past President. Host is W. B. Peirce, Third Vice President.

Other committee heads include: Stephan Urban, General Chairman; William G. Harvey, Attendance; Ray Cannon, Entertainment; L. E. Potter, Plant Visits; Albert Vesper, Publicity; A. H. Mitchell, Reception; T. R. Adams, Technical Session; Fay Atkinson, Hotel Reservations; and J. F. Owen, Banquet.

Thursday, October 12, will be given over to a Board of Directors meeting.

TECHNICAL SESSIONS BRIEFED

Three meetings will be held Friday, October 13. At the morning session the subject will be "Effective Production and Manufacturing Control" presented by International Business Machines Corp. Chairman will be Donald Babcock, Syracuse Chapter.

In the afternoon G. N. Morceau, Elmira Chapter, will preside at a meeting titled "Magnesium Alloys".

L. G. Singer, Assistant Secretary-Treasurer of A. S. T. E., will preside at the evening meeting. Subject will be "Operating a Branch Plant In Canada."

Eastman Kodak Company will present the morning session Saturday October 14. Meeting chairman will be C. G. Newton of the Rochester Chapter.

Educators and industrial training men will participate in a discussion "Tool Engineering Education". O. W. Winter, Education and Training committee will be chairman.

The concluding evening session will be headed by D. D. Burnside, A. S. T. E. President. It will include a banquet and membership meeting. James Y. Scott, President of Van Norman Company and the National Machine Tool Builders Association will be banquet speaker. Present plans call for holding this meeting to members only.

THE NAVY LOOKS AT POSTWAR ORDNANCE

(Concluded from page 101)

At other points I saw plants, some government financed, but, all these completely under the control of the contractor. In all of them I saw an array of machine tools that can be described only as magnificent. I had fancied that I had a fair acquaintance with modern machine tools through a certain amount of reading in trade magazines and through visiting plants in the late '30's, but I realized then that I had approached only the mere fringes of machine tool developments.

I do not feel that I am exaggerating in the least to say that the greatest single debt that the country owes today is due the manufacturers who produced the machine tools which have enabled other of our war industries to do such a splendid job for the country.

SUGGESTS RETENTION OF PLANTS

This suggests a word about the postwar ordnance situation. Recalling earlier mention that a number of plants were built as Naval Ordnance Plants, government-owned, and privately operated, there were also certain other plants built for very specific purposes, likewise government-built, but privately controlled and operated. It will be my recommendation to the Secretary of the Navy that those plants in both categories be retained to form the backbone of the standby ordnance plant installation.

Whether those plants should be operated or whether they should be laid up "in grease" will depend entirely on the size of the Navy which national policy dictates we must retain after the peace treaty is signed.

Whatever that decision may be, it will have to be implemented by Congressional appropriations, which in the last analysis will be the limiting factor on all our operations. Certain specialized machine tools, particularly adapted to ordnance work and of relatively rare application to the normal needs of industry, will probably be transferred from their present plants to existing Naval establishments.

" . . . I do not anticipate that there will be a very large quantity of machine tools in the ordnance field to be disposed of . . . "

George F. Hussey, Jr., Rear Admiral, USN

Other machine tools will be utilized to retool our older plants such as the Naval Gun Factory, where much of our equipment is now outmoded and worn out. Many items in the machine tool category probably will be of interest to private manufacturers. There are many provisions in contracts with such plants for purchase of these tools.

FAVORS CONTINUING WITH INDUSTRY

As a result of such dispositions, I do not anticipate that there will be a very large quantity of machine tools in the ordnance field to be disposed of through the Property Disposal Organization, set up under Mr. Will Clayton.

It is unlikely that there will be any substantial demand for the manufacture of ordnance during the early peace years, but I am in hopes that legislation and appropriations will be such, that the art of ordnance manufacture in commercial plants at least can be kept alive.

There is much talk going about these days concerning postwar planning, termination of contracts, reconversion and the like. It is logical and fitting and proper that such should be the case, always with the reservation that such activities must not take our minds off the job still in hand.

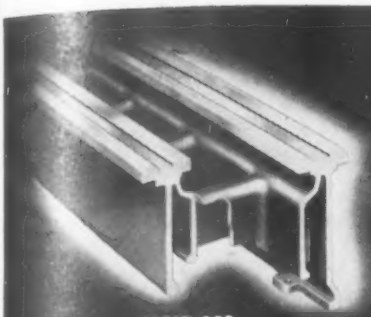
POLICY ON TERMINATIONS, ETC.

It is too early of course for the Bureau of Ordnance to make a flat statement of policy as to termination of contracts and reconversion of plants, beyond the recommendations suggested above. The Bureau's policy must stem directly from the Navy Department, which in turn will be determined by whatever action Congress may take. Much effort is being devoted in the Navy Department, however, to formulation of proper plans and policies with a view to putting them in effect when legislative action has been completed. Presently, of course, termination action is predicated on turns in the war situation.

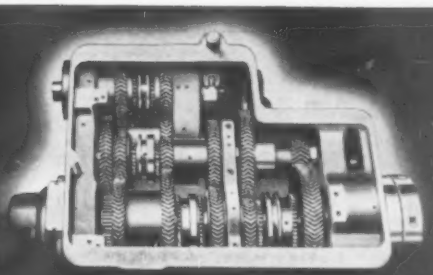
Estimates must be on the safe side. If the war goes better than expected, less material may be required in some categories, others might be eliminated from time to time, and our researchers and developers are continually turning out new ideas which, as they prove to be successful, must be translated into production contracts.

In any case, as Admiral Blandy once observed, "while it is a misdemeanor to have too much, it is a crime to have too little."

Our rapidly growing fleet, with other elements of calculation, now indicate that for probably another year at least, the total dollar value of ordnance procurement (Navy) will remain at about a constant level. THE END



RIGID BED CONSTRUCTION



CONTINUOUS TOOTH 30° HELIX HERRINGBONE GEARED HEAD

Sidney

40TH ANNIVERSARY

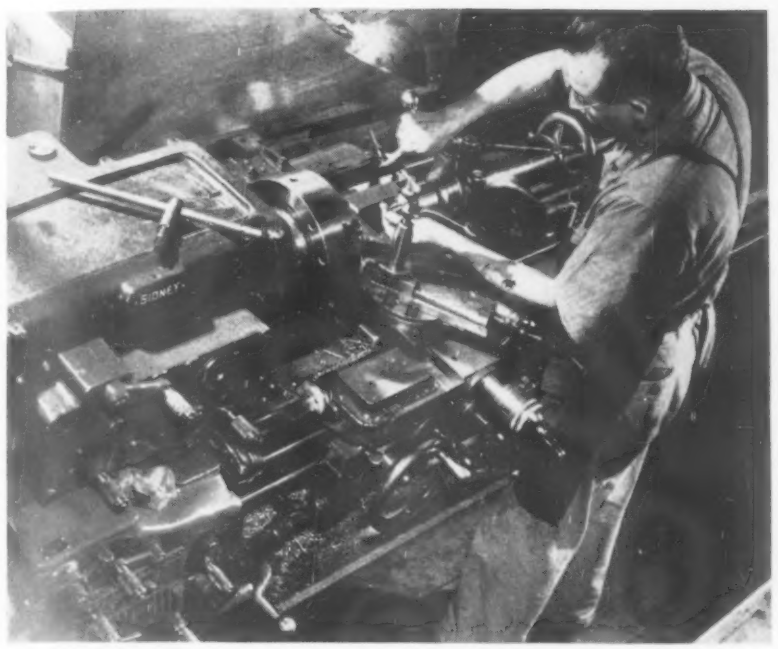


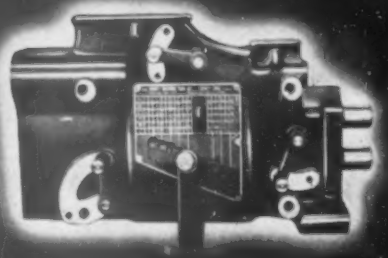
Photo courtesy of Consolidated Vultee Aircraft Corporation.

An intimate view of a SIDNEY LATHE *at work*

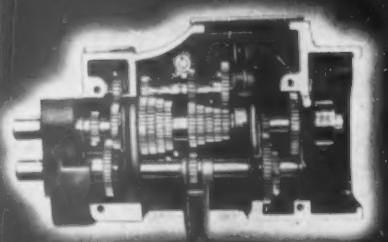
In Aircraft plants—in tool rooms—in manufacturing plants—wherever accuracy is the keynote of production you'll find hundreds of Sidney Lathes producing close tolerance work vital to our war effort.

Sidney Lathes are rigidly constructed from the floor up—a smooth flow of power is delivered through the continuous tooth Herringbone Geared Headstock—and ease of operation is positively assured by convenient location of all controls.

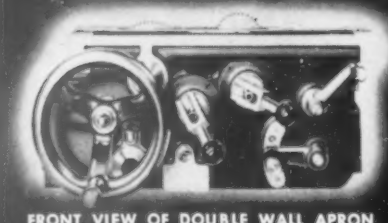
These are a few of the many design and construction features that are steadily gaining a wide acceptance for Sidney Lathes on precision turning operations. *Bulletins on all sizes available.*



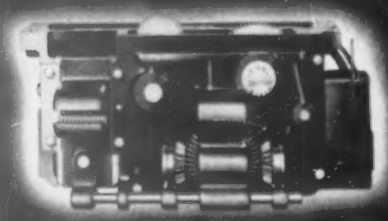
FRONT VIEW OF GEAR BOX



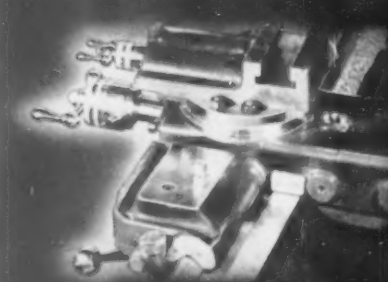
REAR VIEW OF GEAR BOX



FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON



SIDNEY COMPOUND REST

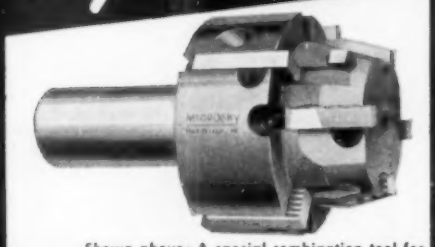
SIDNEY

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

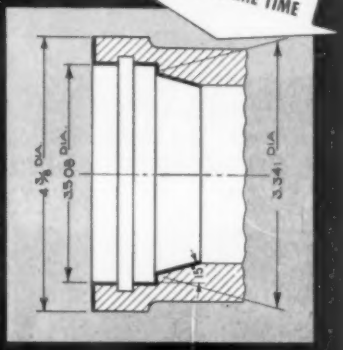
SIDNEY — ESTABLISHED 1904 — OHIO

McCROSKY *Specials*



Shown above: A special combination tool for taper boring, counterboring, and facing.

This one tool does four operations AT THE SAME TIME



cut machining TIME and COSTS

Some McCrosky "specials" are single operation tools to meet conditions that do not permit the use of a standard tool. More frequently — like the example above — the "special" combines 2, 3, sometimes 5 or more machining operations in a single tool,—thus shortening machining time,—and reducing production costs.

These "special" tools employ the exclusive, time-tested, patented blade locking, adjusting and locating devices that have long been associated with McCrosky manufacture. They are strong and rugged on the job . . . easily and quickly adjusted, reground or rebladed. They pay their way on short runs as well as quantity production . . . and are skillfully designed to the individual specific job, to effect greatest possible economy and efficiency. Bulletin No. S-17 gives full details. Send for a copy.

COST CUTTING TOOLS

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

Designers and Manufacturers of
Jack-Lock MILLING CUTTERS *Block Type* BORING BARS
Wizard CHUCKS AND COLLETS
Super Adjustable REAMERS *Turret* TOOL POSTS

(Continued from page 112)

Ex-Cell-O Anniversary Recalls Early Tool Shop History

DETROIT—Twenty-five years ago a few workers in the small tools department of one of Detroit's automobile plants joined to stake their scanty resources in the future of the "precision idea" in industry.

On the second floor of an old building on a back street in the Motor Capital they set up shop, called their new business the Ex-Cell-O Tool and Manufacturing Company. To outward appearances, the infant organization was another general tool shop producing small orders of jigs, fixtures, dies, drill jig bushings, and short runs of automotive parts.

Phil Huber, Ex-Cell-O President

But the history of that organization during the intervening quarter-century became an inspiring saga in American business. Today, the Ex-Cell-O Corporation is one of the world's largest manufacturers of machine tools, cutting tools, precision parts, and other fine metal-cutting equipment. Its employees now number 10,000, its several plants comprise nearly 1,000,000 square feet of floor space.

In observance of its Silver Jubilee, the Corporation has published a 56-page book on its history, products and plans for the future. "The First 25 Years," is highlighted by a message from Phil Huber, President and General Manager of Ex-Cell-O. Huber was one of the original small group who left auto plant jobs to form the concern in 1919.

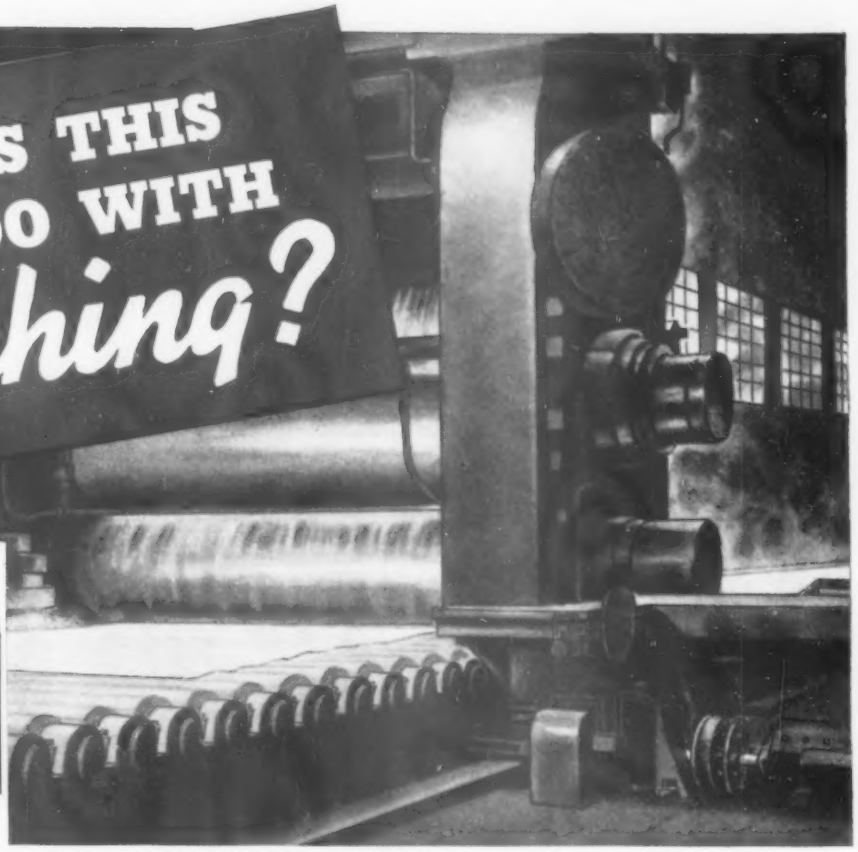
WPB Inaugurates New Index of Surplus Machine Tools

WASHINGTON—Indicating that the Government is continuing its efforts to put idle machine tools to work, shorten the gap between war plant requirements and the machine tool industry's ability to deliver, the War Production Board has revealed the establishment of a new card record system by which public-owned equipment available for transfer may be located quickly.

Inauguration of the new system follows trade press revelation of the failure of the previous system to stimulate

(Concluded on page 138)

WHAT HAS THIS TO DO WITH *broaching?*



ONE of the earliest and most important engineering discoveries of all time was the lever, whose force potential moved a wise ancient to declare that . . . if given a lever large enough, and a star to serve as its fulcrum . . . he could move the world! Although, in its pure form, an earth-moving lever is impractical, the lever today performs, almost unrecognized, a multitude of useful functions. Its truly earth-moving potentialities are to be found in the lever's formula of power application . . . energy + ingenuity = efficiency!

It seems a far cry from the claw hammer to a huge rolling mill, where huge red-hot ingots are transformed as if by magic, into wafer-thin sheets . . . yet the principle remains constant. You couldn't beat out miles of thin steel plate with a carpenter's hammer . . . nor could you pull out a hard driven spike with your fingers. Both are examples of the lever's theory that a minimum of energy correctly applied can not only move the world . . . but can make the world a better place to move in.

BROACHING is a further development of this principle. Eliminating needless operations and speeding up production, it requires *less* energy to produce *more* . . . resulting in fewer man and machine hours to produce each part. Parts mass-produced in a fantastic variety of complex shapes and sizes to uniformly close tolerances. It will pay you to investigate the possibilities of broaching in your plant.

Just as Lapointe pioneered in the designing of broaches and broaching machines for the mass production of precision parts . . . so too, will Lapointe continue in its quest to make better things for a better world . . . quicker and cheaper!

Earliest use of broaching principle on this continent was by soldiers of the Revolution, who drove steel balls through heated rifle barrels to give the correct bore.

ARMY E NAVY

The LAPOINTE *Machine Tool Company*

HUDSON, MASSACHUSETTS, U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

ALLEN PRECISION Dowel Pins

PRECISION pins for accurate locating of work; for retention of tool and die assemblies under severest stresses. Ground to a limit of .0002" over basic size, with an allowable tolerance of plus or minus .0001".

Metallurgically in the class of ALLEN Hollow Screws: — made of the same special-analysis ALLENOY steel and heat-treated with the same scientific controls. The outer surface is extremely hard with a core of sufficient hardness to resist any tendency to "mushroom" when driven into a tight hole.

Ask your local Industrial Distributor for samples and dimensional data, — the same Allen Distributor who serves your interests with the most dependable supply-items in all lines.

THE ALLEN MANUFACTURING COMPANY
HARTFORD, ★ ALLEN ★ CONNECTICUT, U.S.A.

MACHINE TOOLS

(Concluded from page 136)

the use of idle machines through transfer from one plant to another. Obviously, the Government statement on the new card system did not mention the earlier failure.

Form WPB-3475, for reporting idle Government-owned machine tools, has been extended six months. It has been reprinted with no substantial changes and sent to all WPB field offices.

Information received on this form, it was said, will be transcribed on the new cards, known as Form GA-1796. These will show available machine tools and the plants in which they are located. The cards, it is planned, will be tabulated and distributed to WPB field offices and others charged with recording increases and decreases in the number of unused machine tools available in the United States.

Coincident with the installation of the new card record system, the Available Tools Section, WPB Tools Division, is discontinuing the publication of the "Available Tools List". Bulletin Number 13, April 9, 1944, was the last list to be issued, it was said.

PRODUCTION ROUND-TABLE

(Concluded from page 104)

describes every part in the machine with a number," he pointed out. "The only trouble is that frequently you don't know what they are talking about. For instance, the term "housing" will cover many things on a machine. The part itself should be stamped with a number corresponding to that in the catalogue."

Ernst gave machine tool builders a cue when he observed that "in purchasing new equipment many of us are influenced by existing tools rather than go into a new line, although for all practical reasons it may be better. Yet we are influenced by the fact that we have thousands of dollars tied up in maintenance items, and we are inclined to stick with the old line."

The recommendation was made that builders standardize on the types of oils, specified for lubrication. Individual machines were cited that require as many as four different oils.

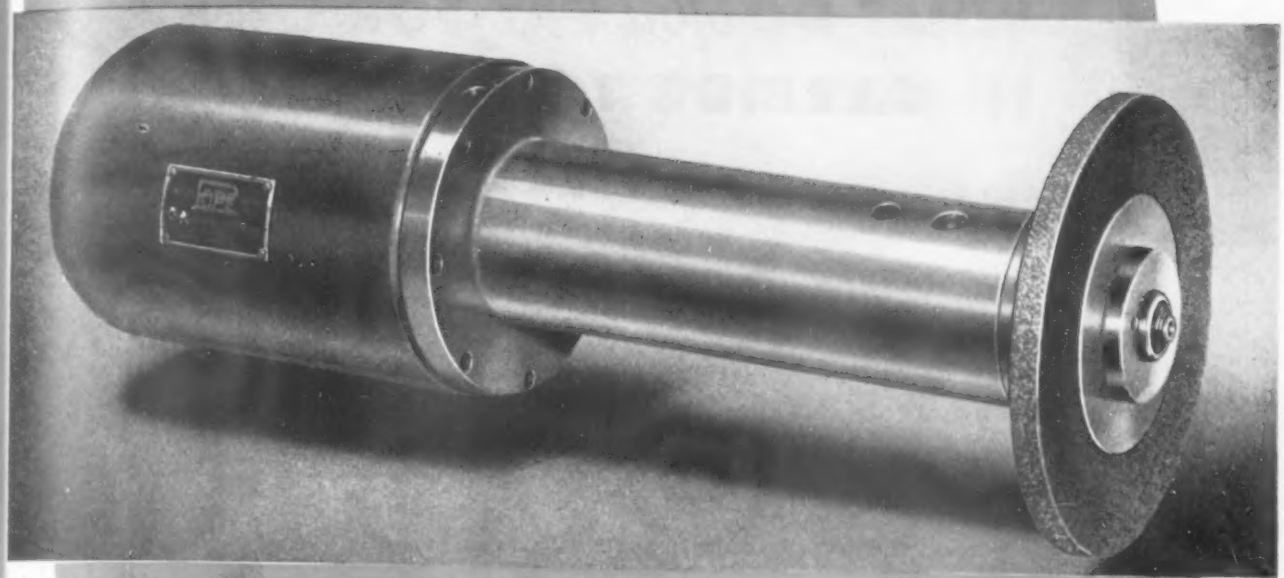
While discussing oil requirements, Ernst pointed out that "in some cases builders put a drain plug about an inch from the floor and then expect you to get the oil out."

One Milwaukee engineer, expressed interest in knowing whether machine tool builders are considering the problem of accessibility of parts. "I don't like the idea that you have to take the whole machine down to get one shaft out," he said. Criticizing streamlining that covers operating parts, another Round-Table participant cited the breakdown of an automatic chucker as a typical example of simple repair resulting in a major operation.

Inaccessibility of joints in hydraulic units imposed by bad design has developed as a major drawback to wider application of this otherwise highly satisfactory method of control, according to several participants in the Round-Table.

THE END

Replace Your Surface Grinder Spindles with This New POPE SEALED MOTORIZED UNIT



and get finer finishes—more production

Where to Use This New POPE SEALED MOTORIZED UNIT

The performance and operating advantages of this new Spindle justify immediate replacement of existing spindles on all makes of 6" x 18" surface grinders. Its sealed-in motor may be 220 or 440 volt — 2 or 3 phase — 60 cycles, or 550 volt — 3 phase — 60 cycles. It operates horizontally, vertically or at any angle so it may be used to equally good advantage on boring mills, planers, milling machines or other machine tools for special work.

Don't wait until your present spindles wear out. This new POPE Spindle is so good you ought to be getting the benefit of it right now.

It's a completely *sealed package*, motor and all. Think of it! No chance for dust and dirt to get into the motor and destroy its efficiency. No worry about lubrication.

Pope precision craftsmanship, the *sealed-in* G-E full 1 HP motor, SKF Super-Precision Double Row roller bearings and massive construction combine to produce definitely finer surface finishes. It saves time, too, for it has the rugged ability to rough off surplus metal fast whenever necessary.

Try this Spindle and see for yourself why it belongs on your machines.

POPE

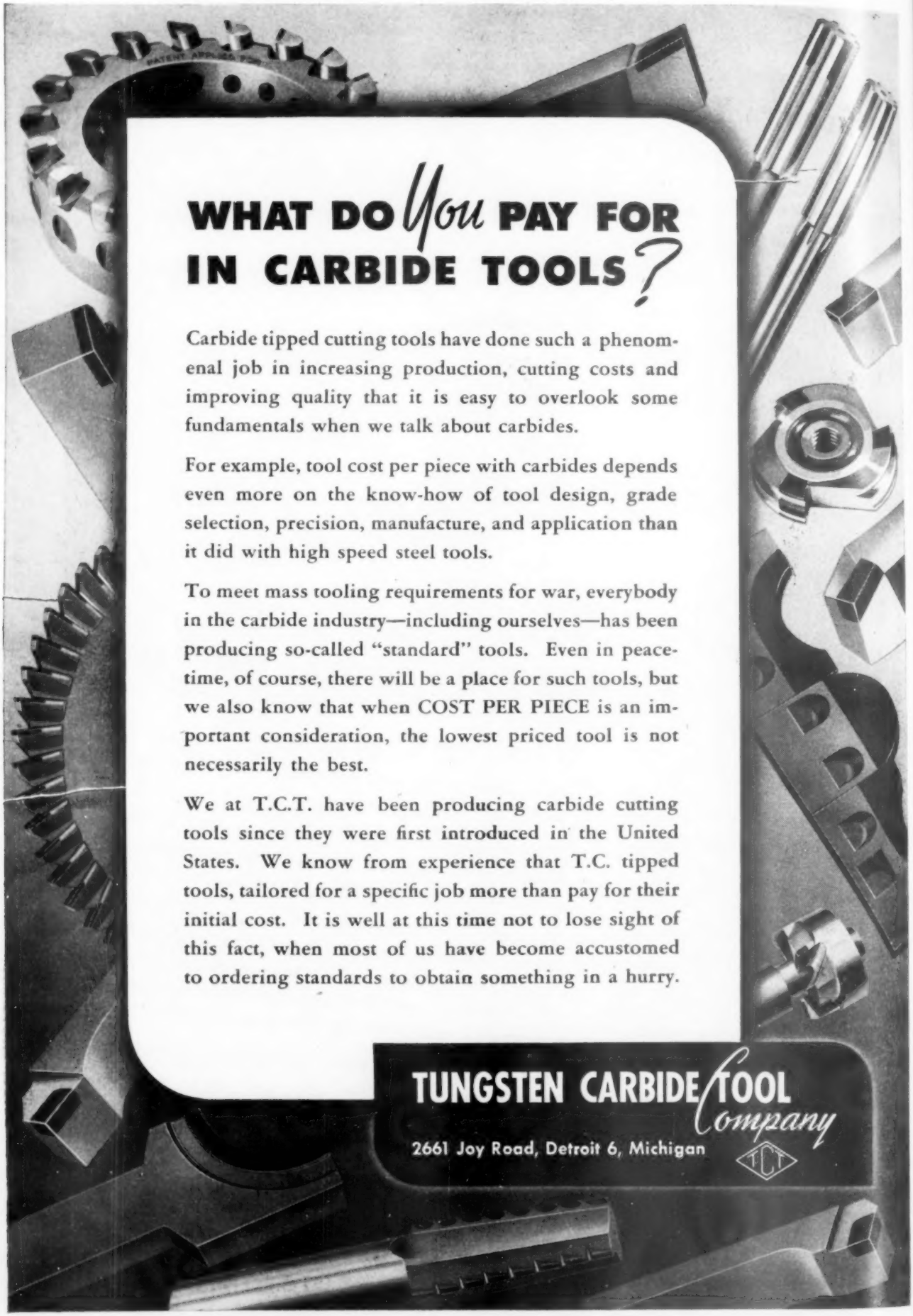
REG. U. S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES



WHAT DO *You* PAY FOR IN CARBIDE TOOLS?

Carbide tipped cutting tools have done such a phenomenal job in increasing production, cutting costs and improving quality that it is easy to overlook some fundamentals when we talk about carbides.

For example, tool cost per piece with carbides depends even more on the know-how of tool design, grade selection, precision, manufacture, and application than it did with high speed steel tools.

To meet mass tooling requirements for war, everybody in the carbide industry—including ourselves—has been producing so-called "standard" tools. Even in peacetime, of course, there will be a place for such tools, but we also know that when COST PER PIECE is an important consideration, the lowest priced tool is not necessarily the best.

We at T.C.T. have been producing carbide cutting tools since they were first introduced in the United States. We know from experience that T.C. tipped tools, tailored for a specific job more than pay for their initial cost. It is well at this time not to lose sight of this fact, when most of us have become accustomed to ordering standards to obtain something in a hurry.

TUNGSTEN CARBIDE TOOL *Company*

2661 Joy Road, Detroit 6, Michigan

TCT

THE CONE AUTOMATIC MACHINE COMPANY
sees many
GOOD THINGS AHEAD

It is reported that . . . . . .

Instant-starting fluorescent lamps in a greater variety of shapes and sizes are promised after the war.

get ready with CONE for tomorrow

A laboratory model of an electron microscope has been made that fits into two suitcases and weighs 133 pounds.

get ready with CONE for tomorrow

One large processor of cereals intends to go into the manufacture of electrical appliances for use as premiums.

get ready with CONE for tomorrow

An aircraft manufacturing company has announced its intention of manufacturing washing machines and refrigerators after the war.

get ready with CONE for tomorrow

Natural gas is being frozen and stored for emergency use in one American city. It is believed possible to ship gas in this form from the oil fields to Eastern markets.

get ready with CONE for tomorrow

The American Petroleum Institute reports that proved reserve sources of crude oil are sufficient to meet requirements for "many generations".

get ready with CONE for tomorrow

A waterproof match has been developed for jungle use and should be a convenience to hunters, campers, and fishermen after the war.

get ready with CONE for tomorrow

The Navy is using concrete storage tanks for gasoline. Seepage is prevented by painting the inside with sodium silicate.

get ready with CONE for tomorrow

A new chromium plating salt is claimed to be more economical and non-poisonous.

One large manufacturer of automotive engines will have a lightweight, air-cooled, four-cylinder opposed engine, based on its aircraft engines, for low-priced, post-war automobiles.

get ready with CONE for tomorrow

A special new remover makes it possible to strip the paint from blacked-out windows with a hose and cold water.

get ready with CONE for tomorrow

A device, now being added to large radial aircraft engines, injects water into the combustion chamber for better cooling, less detonation, and greater fuel economy.

get ready with CONE for tomorrow

A new tool prevents wrinkles in pressed sheet metal.

The new 4.9 mile Chicago subway is the first section of a system of four units planned to include 55 miles of line and to cost 275 million dollars.

get ready with CONE for tomorrow

The Alien Property Custodian has granted licenses to use more than 2,500 of the 45,000 enemy patents that he is holding.

get ready with CONE for tomorrow

Ultra sound waves are being used to break the oxide layer from the surface of sheet aluminum before plating with tin.

get ready with CONE for tomorrow

A new electric motor weighing 7 pounds develops 3 horsepower at 120,000 r.p.m. and reaches full speed in less than a second.

get ready with CONE for tomorrow

One application of a new chemical insecticide to the walls of a room is said to continue to kill flies for three months.

NEW ENGLAND CARBIDE..

HAS A VALUABLE BACKGROUND OF EXPERIENCE IN MAKING *SPECIAL* CARBIDE TIPPED TOOLS AND PARTS

SPECIAL

Flat and circular form tools are ground and lapped to a mirror finish. Most modern manufacturing and testing equipment assures exact tolerances specified.

SPECIAL

Ring gages in all American Standard tolerances, and any specials desired — wear surface tipped with tungsten carbide or boron carbide for long life.

Special solid tungsten carbide reamers and any other solid tools and parts requiring close tolerances and mirror finish. Also a complete line of standard reamers from 3/16" to 1½".

SPECIAL

Special plug gages tipped with tungsten carbide or boron carbide—also a complete line of standard sizes. Ask us about the thousands of wear parts that we have tipped with boron carbide.

Dies and punches to meet every special requirement such as lamination dies, powder dies, etc. Pill dies, made with boron carbide inserts, show a minimum of 6 times the life of any other hard insert material.

IT WILL PAY YOU to take advantage of New England Carbide Tool Company's experience if you need tipped tools calling for unusually close tolerances and fine finish. Our files are filled with special jobs that were made for the country's leading manufacturers . . . and many of these tools and parts would have been thought impossible or impractical a few years ago. Take such things as complicated, solid carbide tools, finishes within a couple of micro-inches, tolerances in millionths, etc. It takes special knowledge, special equipment, and a desire to do things a little better than the other fellow to produce tools like this. You will find this kind of workmanship and know-how at New England!

If your tools are tipped at New England, they *can't be topped!* Why not let us quote on some of those special, difficult jobs?

***ALSO** a complete line of standard tungsten carbide tools, and standard and special tools and products tipped with boron carbide and diamonds.*

NEW ENGLAND CARBIDE TOOL CO., Inc.

60 BROOKLINE ST., CAMBRIDGE 39, MASSACHUSETTS

ANNOUNCING THE

New WETMORE REAM-MOR PROCESSED REAMER BLADES

GREATER WEAR RESISTANCE

LONGER CUTTING LIFE

LOW IN COST

REAMER BLADES that are—longer wearing, harder, tougher, better cutting—those are the results of Wetmore REAM-MOR processing.

These new blades were developed through long research and experimental work done by Wetmore metallurgists and engineers, in the laboratory, plant and field. They are the product of broad reamer experience and a desire to create an economical high speed steel blade specially processed, that would have the wear resistant qualities of "premium" alloys.

Developed by a reamer manufacturer especially for better, low cost reaming, Wetmore REAM-MOR Blades are another example of Wetmore Quality Tool Service. Available for all model Wetmore Reamers—why not try a set and increase production, reduce grinding—and lower blade costs.

Send for the New REAM-MOR blade bulletin for complete details.

WETMORE REAMER CO.

409 North 27th Street, Milwaukee 8, Wis.

WETMORE REAMERS.... BORING BARS

THE *Carbide* AGE

INVADING NEW FIELDS, WITH NEW METHODS IN MACHINING OF METALS

SLASHING COSTS—SETTING UNDREAMED-OF PRODUCTION RECORDS!

Here's one of many examples of revolutionary progress being recorded daily by **WESSON** Carbide Cutting Tools.

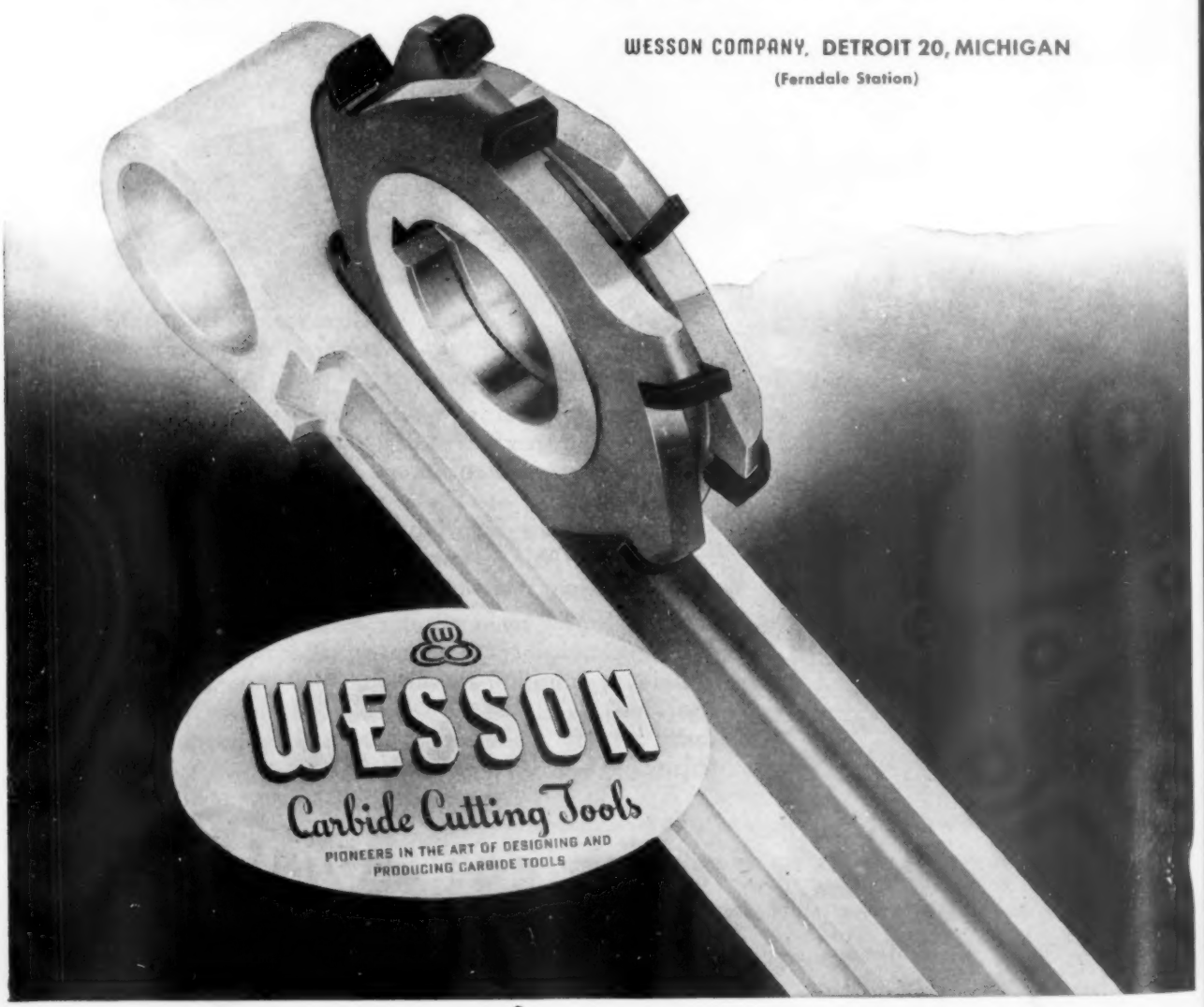
Formerly . . . difficult form-slotting on an extremely hard tough molybdenum steel connecting rod (S. A. E. 6412, testing "40 Rockwell C") . . . required 4 operations and 13 minutes.

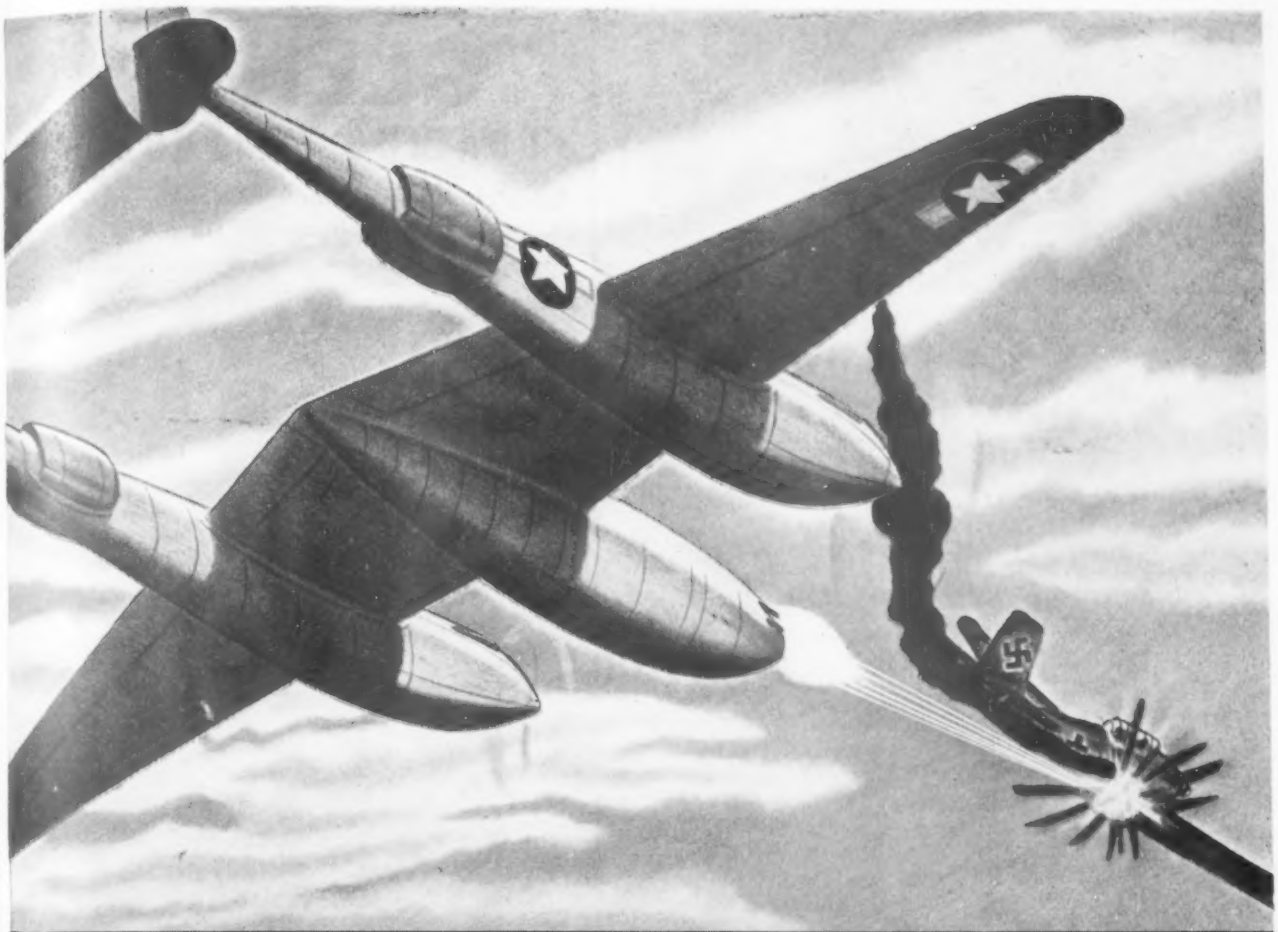
Now . . . WESSON-designed Carbide Form-Interlocking-Milling Cutters with new "negative rake and helix angles" and a special type of carbide, finish the same job in ONE operation and in only ONE minute! The WESSON method eliminates two milling operations and one precision grinding, formerly done by 35 special grinding machines, each costing $6000.00. The saving, 24 minutes per rod . . . and 105 highly skilled operators are now released for other vital work!

Simpler, faster production . . . lower costs . . . higher precision . . . finer finish . . . less tool grinding and resharpening . . . longer tool life . . . production COSTS cut way down . . . and the VOLUME stepped way up.

It's simple to convert to WESSON Carbide Tools. Wesson tool engineers are ready to assist you. . . . Phone, wire or write

WESSON COMPANY, DETROIT 20, MICHIGAN
(Ferndale Station)





This one's on you, Adolph!

Yes, the tables have turned. Was a time when your vaunted Luftwaffe ruled the sky . . . but that was before our Army Air Forces got on the job.

That buzzing sound in your ears is the nest of angry hornets you have stirred up . . . vengeance-bound, hard-hitting planes.

These planes are blazing a path to certain Victory. Each carries the sting of death . . . rapid-firing cannon and machine guns from which there is no escape. You marvel at the unfailing stream of steel they pour on you?

The secret of that is the careful gaging of those shells. We at Quality Tool & Die know because we produce the inspection gages used to assure that there will be NO interruption in that hail of death to your Axis.

Back the Attack with War Bonds

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why every production man should be familiar with

THE *Ettco-Emrick* SYSTEM OF MULTIPLE TAPPING AND DRILLING

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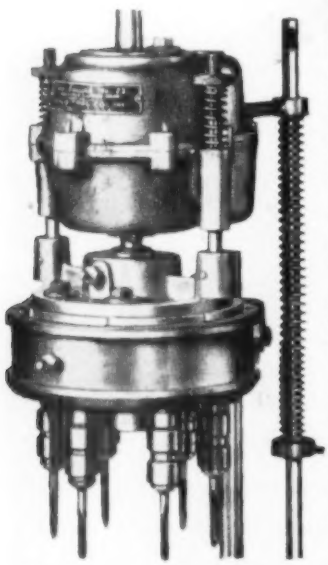

Typical Ettco-Emrick Multiple Tapping Head with high-speed, sensitive central driving and reversing mechanism. The gear case assembly is interchangeable on the drilling head.

2. It provides both the **method** and the **equipment** needed for obtaining highest production.

3. It represents the **lowest tooling cost** for multiple tapping and drilling, because the equipment is made of standard stock parts and can be used on any drill press or tapping machine.

4. It is especially effective for jobs involving the smaller sizes of taps and drills.

5. It is a necessity for economical mass production of parts in which two or more holes must be tapped or drilled, and can also be profitably used on small lots.

6. It is thoroughly tried and proved, having been in successful use for many years on a wide variety of parts.

GET DETAILS IN BULLETIN No. 3

Copy mailed to you on request. Write for it today, and plan to capitalize the high production and low costs of the Ettco-Emrick System in your multiple tapping and drilling operations.

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The Famous *Ettco-Emrick* **DRILL CHUCKS • TAP HOLDING CHUCKS**
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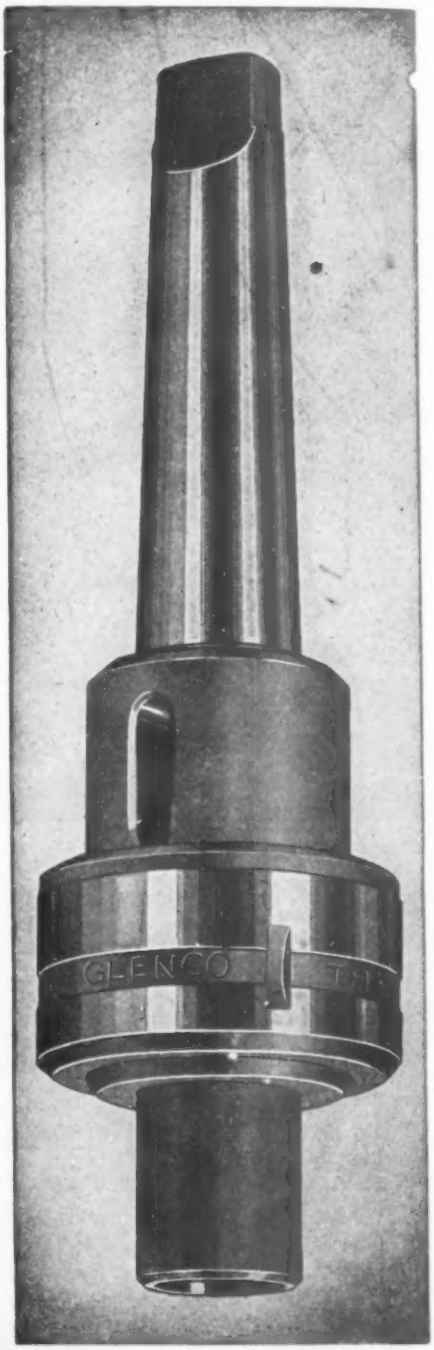
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

GLENCO

FLOATING TOOLHOLDER

Corrects Machine Tool Misalignment By Producing TRUE and ACCURATE Holes



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Utility Tools

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TAP CHUCKS
DRILL CHUCKS
ADJUSTABLE ADAPTERS
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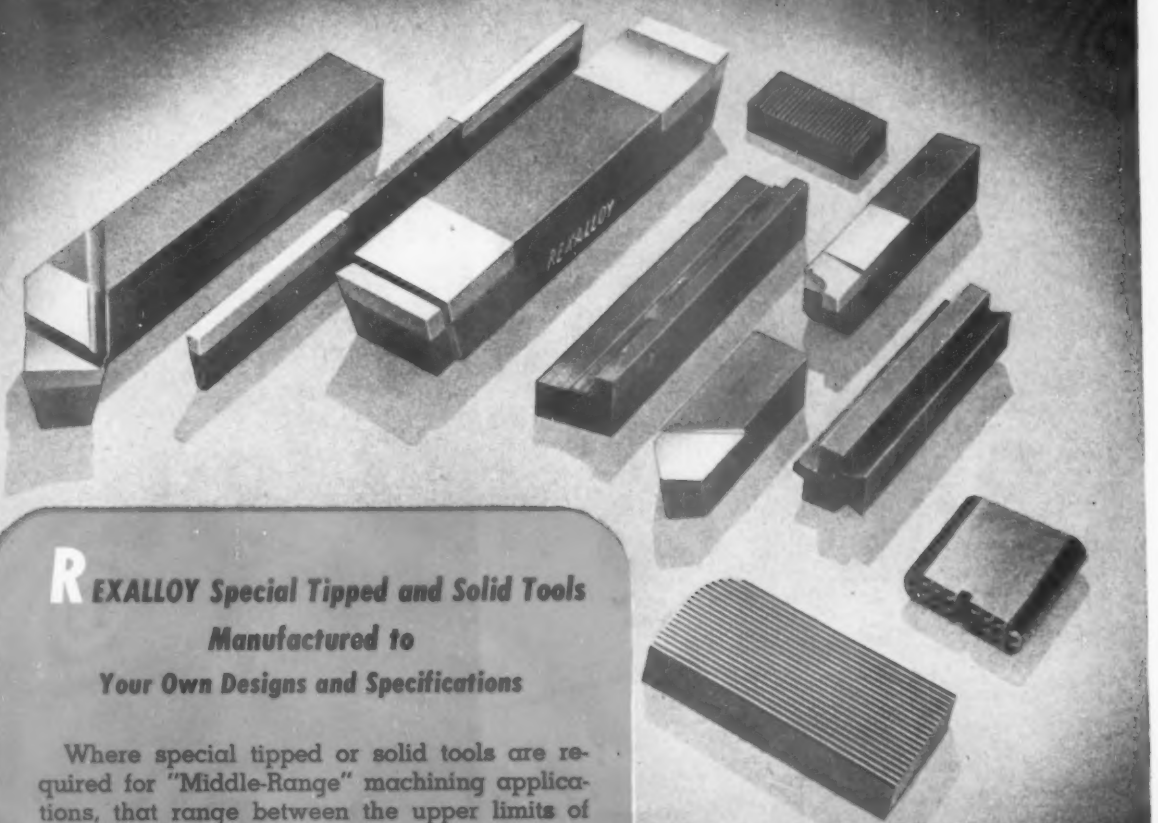
CORE DRILLS

THE J. C. GLENZER CO.

DETROIT **MICHIGAN**

REXALLOY

STANDARD TOOL BITS • STANDARD TIPPED TOOLS • SPECIAL TOOLS—TIPPED AND SOLID • CASTINGS



TYPICAL SPECIAL REXALLOY TOOLS MANUFACTURED TO CUSTOMERS' SPECIFICATIONS

REXALLOY Special Tipped and Solid Tools Manufactured to Your Own Designs and Specifications

Where special tipped or solid tools are required for "Middle-Range" machining applications, that range between the upper limits of high speed steel and the lower limits of tungsten carbide, it pays to use **REXALLOY**. Crucible is in a position to furnish special **REXALLOY** tools, tipped or solid, to meet your requirements. Too, **REXALLOY** Service Engineers are prepared to assist your engineers in the design of such special tools to secure the full advantages of **REXALLOY** in increased speed, feed or depth of cut, better work with fewer grinds.

To enable an appraisal of **REXALLOY'S** advantages, your nearest Crucible Branch will gladly arrange for a competitive demonstration in your plant by a **REXALLOY** Service Engineer.

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☐ Please mail me your new 28-page book, *"REXALLOY CUTTING TOOLS"*.

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Your Tapping Questions

When should I use a two-flute tap?

What is meant by per cent of thread?

Is the type of cutting oil important?

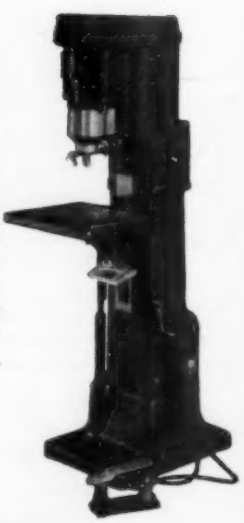
How much chip clearance should I allow in a blind hole?

How can I get more tap life?

Which holding fixture?

Answered

These are some of the more common questions we answer almost daily. Precision tapping is a science in itself, and even an experienced operator will occasionally run into a snag—some new problem on which he can use a little outside help. When you reach that point—call on us. Our engineers are trained in the field. Draw on their experience and knowledge to reach a solution to your problem quickly and easily. Write for our catalog on Precision Tapping at High Speed. Send your questions to R. G. Haskins Co., 2756 West Flournoy Street, Chicago, Illinois.



HASKINS highspeed TAPPING MACHINES

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THREAD GRINDING OF PRECISION PARTS

We are equipped to grind threads to .001 pitch diameter tolerance, or closer if required. Production to your blueprint specifications.

Also: Taps · Gages · Steel Stamps and Dies

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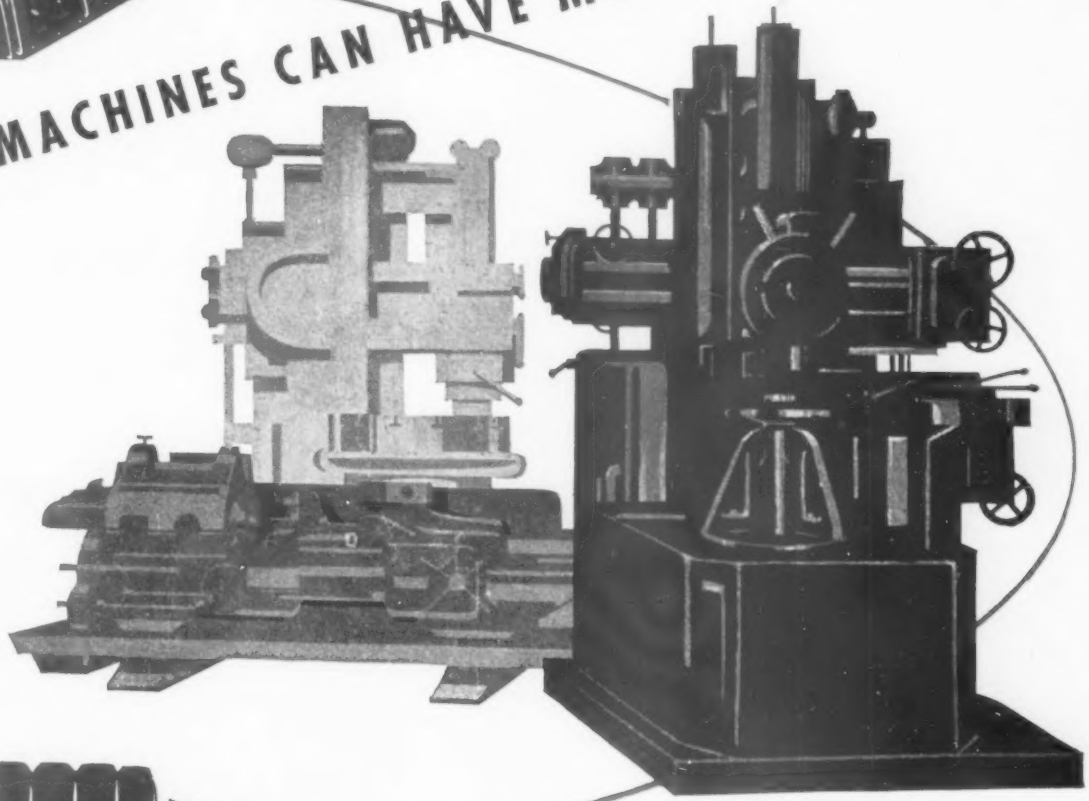
NOW...MACHINES CAN HAVE MULTI-TRACK MINDS



For the first time—an automatic control that is as versatile as manual control

The Bullard "MAN-AU-TROL" principle of automaticity transfers to a simple automatic control, man's ability to think and act for himself . . . and with an accuracy and consistency far beyond any man's ability.

A machine, for example, can now be made to turn out a given part . . . and then can be changed over to machine an altogether different part . . . in a matter of hours, not days.

Thus the Bullard "MAN-AU-TROL" gives you the advantage of *increased production* and *lower costs* offered by special-purpose machinery . . . plus the advantage of complete flexibility within the range of manually operated machinery—flexibility that even includes manual operation, instantly, as desired.

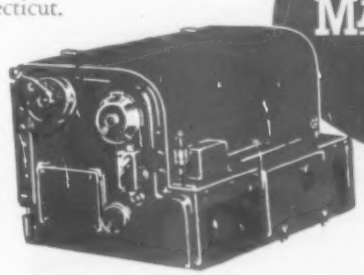
The Bullard Company, Bridgeport 2, Connecticut.

BULLARD

MAN-AU-TROL

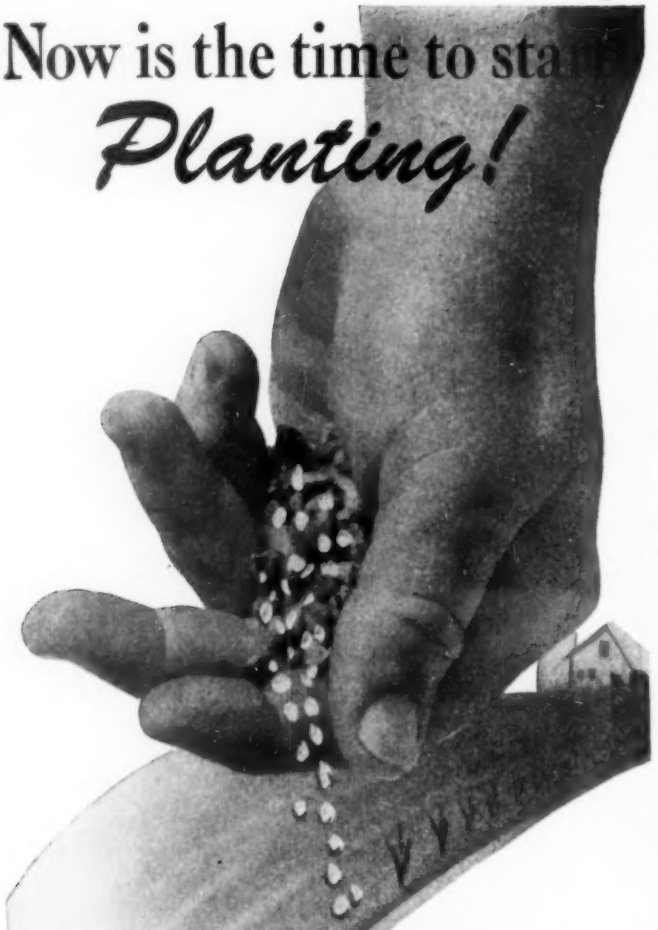
MASTER OF THE MACHINE

The automatic control that is as versatile as manual control



100% automaticity . . . no human or cumulative error . . . control to closest tolerances *—a tremendous cost advantage in competitive markets!*

Now is the time to start *Planting!*



☆ and any seed for healthy post-war growth must include the new elements that contributed so much to victory.

OH-38 Aluminum Alloy—an exclusive Hedstrom product—has proven its superiority in hundreds of war products and permissible civilian items. You will want it for the component parts of your new and improved products—for parts that can be made better, faster, cheaper—with OH-38.

OH-38 is used only in castings by Hedstrom.

Send for complete technical information.

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Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications

Counteract BACK and SIDE WEAR

with improved MILFORD PROFILE SAW . . .

It is a fact that most contour and profile saws fail on the back and the sides before the hardened cutting edge wears. Not so, MILFORD PROFILE SAW!

This is but one of the many accomplishments of MILFORD metallurgy.

SERVICE? One of the large manufacturers of airplanes needed some PROFILE SAW in a hurry. They telephoned us . . . "Could we ship 8 miles of PROFILE SAW at once?" That was only a little over 42,000 feet, and we shipped it from stock that very day. True, we couldn't duplicate that every day, but our stocks are large and complete, and shipments are prompt.

THE HENRY G. THOMPSON & SON CO.
Saw Specialists Exclusively for Over 65 Years
NEW HAVEN, CONNECTICUT, U. S. A.

Now, **Accurate Reflex Torquing—**
faster than thought...

WITH THIS NEW WRENCH, accurate torquing becomes fast and automatic. When the exact "set" torque is reached, the SENSORY Mechanism sends three simultaneous nerve impulses to the operator's muscular control center, instantly releasing the tension by reflex action. Recorded through three channels—sight, sound and feeling—all three at once—or by any one of them individually, automatic reflex torquing is obtainable under every working condition, in spite of operator's physical handicaps—deaf, blind, or maimed, or degree of inattentiveness.

This new Sensory feature is built into standard STURTEVANT Permanently Accurate Torque Wrenches—the indestructable torque measuring wrench universally used for production, inspection and wherever torque must be accurately gauged. In the Sensory Wrench not a single basic Sturtevant design or construction feature has been sacrificed, though reflex-speed has been added.

7 YEARS OF DEVELOPMENT

As the torquing of vital screws, nuts and threaded parts became a standard production operation, the need for *fast*, sturdy and accurate Torque Wrenches became apparent. As the manufacturers of 80% of the torque wrenches in use STURTEVANT has long been aware of this need. As creators of the Sturtevant Design Principle which eliminated all fragile mechanisms, springs, gears, glass dials and delicate parts and made possible sturdy, practicable tools that remained permanently accurate in the hands of ordinary workmen, *we were determined that our production wrench would have to be not only fast-operating but also sturdily built and above all permanently accurate.* As experienced tool makers we also knew that this wrench would have to give more than visual readings to meet every torquing situation.

For more than seven years STURTEVANT engineers have been working intensely on this problem . . . have been exploring, testing, designing, redesigning, perfecting and rejecting innumerable "speed" and "limiting" torque wrenches of all known and many new designs and principles. From this tireless research has evolved a new thing in high speed production torque wrenches, the *STURTEVANT SENSORY* Torque Wrench—a wrench that in use is faster than thought, still is a true STURTEVANT Torque Wrench that will stand all ordinary shop abuse and yet remain dead accurate.

THE STURTEVANT *SENSORY* TORQUE WRENCH

This new wrench closely resembles the familiar STURTEVANT Torque Wrench in appearance. It's the same size for capacity, weighs about the same also. It too can be dropped into the regular tool box with safety, will withstand the every day abuse given bench tools by careless workmen and still remain "dead accurate" even after long, hard service. It has the same legible STURTEVANT Dials which can be visually read from all working angles. Because experience has shown that visual readings not only provide a quick "check-look", but give the operators the assurance and *confidence* that they *must* have and insist upon, our engineers maintained this feature unchanged in the Sensory Wrench. But here is the difference—whereas the Sturtevant Torque Wrench depended *solely* on visual reading to determine accurate control of applied torque on caps, screws, bolts or threaded parts, the new STURTEVANT SENSORY Torque Wrench embodies two other features—two other safe-guards that help the operator maintain accurate torque at reflex speed—"*sound*" *and* "*feel.*"

These Sensory features work as follows: A finger is provided which can be set at any desired signalling point. And from there on, until re-set, as torque is applied with the wrench, at the exact instant the "set" torque is reached, the sensory action (1) Sounds a loud and distinct click and (2) imparts a definite strong impulse to the hand. Thus, through *three* senses, sight, sound *and* feeling, the operator automatically releases (by reflex action) his pull on the wrench (even before the conscious mind reports it) making torque both fast and dead accurate. Here, through three channels instead of just one, the operator is conscious that the release point is reached, in spite of himself. Stop and think what accurate "reflex torquing" means:

1. It speeds up production while maintaining accuracy of torquing far beyond that possible with any other fast-operating production wrench.
2. Permits accurate torquing in dark or "blind spots," in deafening factory din, and from any working angle under *all* working conditions.
3. It enables physically handicapped workers, who may have one of these three senses impaired (blind, deaf or maimed) to do accurate torquing.

And for you engineers who like figures, read the results of the following field test made on an actual production line of a large engine builder using three 100 foot-pound Sturtevant Sensory Wrenches:

Type of Wrench	Description of Operation	Torque Limits in Ft. Pounds	Number of days in Service	Number of Nuts or Screws Tightened
S-100	Tightening Cylinder Head Cap Screws (21 per engine)	60-65	79	379,447
S-100	Tightening Connecting Rod Nuts (12 per engine)	40-45	79	227,520
S-100	Tightening Main Bearings (8 Main Bearing Cap Screws per Engine)	80-85	67	138,240

NOTE: Set only once, the day they were put on the job, these wrenches were checked periodically and found to be dead accurate throughout the test—no repairs, no re-settings, no adjustments.

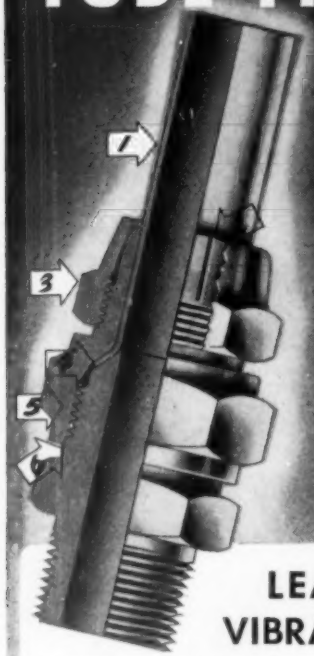
Think what this means to industry . . . to your business in speeding up war production . . . what it can mean to you in post war competition. Any operator can now torque *accurately* without watching a dial—can torque automatically, even the wrench automatically "re-cocks" itself after each pull.

Write for Bulletin SW-28

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

Buy More War Bonds

STRONGER
THAN THE TUBING ITSELF
COLLET GRIP
Seals as it grips
TUBE FITTINGS



1 Permit use of tubing in wide range of wall thicknesses.

2 SLOTTED collet insures uniform grip of tubing surface, protecting flare seal.

3 COMPRESSION NUT compresses Collet Nut to tube, forming permanent collet grip that cannot loosen.

4 DESIGN directs pulling stresses and vibration strains away from angle of flare.

5 COLLET NUT has long bearing surface which grips tube securely beyond the flare.

6 Easy to assemble and disassemble. Use repeatedly.

LEAK-PROOF VIBRATION-PROOF

Collet Grip Fittings embody a unique design principle that eliminates transmission of vibration and shock to tube connections—actually resulting in connections stronger than the tubing itself. This means leak-proof connections, and long, trouble-free service. Quickly installed, *Collet Grip Fittings* may be used over and over again—easily assembled or disassembled simply by tightening or loosening the compression nut. No threading, welding or soldering necessary. *Collet Grip Fittings* are now standard equipment in many of the nation's leading industrial plants. Write for Catalog No. 43 containing complete technical data.

LOGANSPORT MACHINE COMPANY, INC.
(Fittings Division)
902 PAYSON ROAD • LOGANSPORT, INDIANA

DOUBLE NUT COLLET GRIPS
—as illustrated above, are made in 5 standard shapes. Special shapes and sizes to specifications.

COLLET GRIP

SINGLE NUT COLLET GRIPS
Simplified for close work, yet retaining all features of Collet Grip design. Five standard shapes, sizes from ¼" to 1". Special sizes, shapes to specifications.

13 minutes per cut of 4¾"... and 70 cuts per saw!

... with SIMONDS Metal Bands

For straight cuts, or for contour sawing, Simonds Hard Edge Metal Band Saw Blades stand up longest... cut with greatest smoothness and accuracy... delivering performance such as that cited above, *which was a competitive test on SAE 1035 steel.* This is assured by even tooth-set on both sides of blade, by correct milling of teeth, and by automatically controlled hardening of the alloy blade. Finally, joints are welded for utmost strength.

This extra quality means accuracy that saves the time and expense of many milling and shaping operations. Have your industrial supply distributor bring a Simonds Cutting Engineer to survey your metal-bandsawing operations—and see what he can do to step up output and blade-life.

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PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

This PART (as shown) MADE IN ONE OPERATION

WITH THIS STRAIGHT TOOLING

ON A MODEL A 2½"

CLEVELAND AUTOMATIC

A "production headache" solved by use of the right equipment . . . made from Dural hex bar stock, with multiple I.D. and O.D., matching thread and tolerances held to .003, total indicator reading. First position (after gauge stop) center rough drilling and rough turning front O.D., with both tools mounted on the same station: Front body O.D. then finish-formed with front cross-slide: Next position rough drilling smallest I.D. Back O.D. finish-formed in one stage with rear cross-slide: I.D. then finished with counterbore (tolerance here +.002 —.000). Tapping done on last station and part delivered by the independent cut-off. Production rapid for this type of work.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND 3, OHIO

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Ask for Cleveland Bulletin on Automatic Production Equipment

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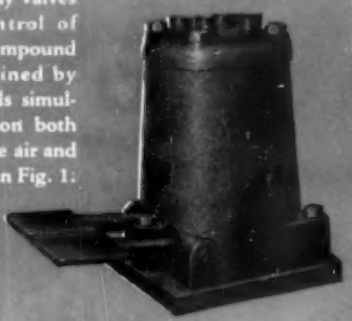
Quick—As—Wink

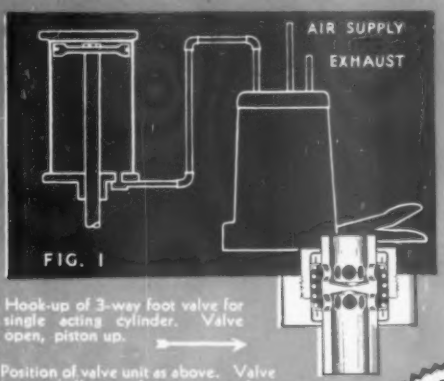
• • • CONTROL VALVES

Compound exhaust four-way valves are suitable for the control of double acting cylinders. Compound exhaust position is obtained by placing foot on both pedals simultaneously, in which position both valve units are closed to live air and open to exhaust as shown in Fig. 1.



One pedal may be depressed from the middle position connecting one end of air cylinder to live air with other end open to exhaust. Depressing the other pedal reverses the cylinder action. When both pedals are leveled again to the middle or neutral position, both ends of the cylinder are open to exhaust.

Four-Way Foot Operated Quick-As-Wink Valve with Compound Exhaust Position



Hook-up of 3-way foot valve for single acting cylinder. Valve open, piston up.

Position of valve unit as above. Valve is open, allowing free passage of air to cylinder.

THE HIGHER THE PRESSURE — AIR WATER OIL — THE TIGHTER THE SEAL

C.B. HUNT & SON

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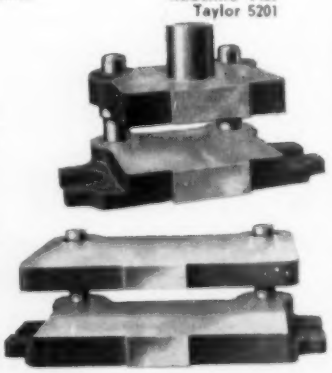
Quick service on all Special Die Sets and Bolster Plates from Bridgeport and Detroit.



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Insure Drilling Accuracy with Universal Drill Bushings

Universal Drill Bushings save valuable tool drills. Superfinished bores insure accuracy and unexcelled wearing qualities. All standard sizes available. Write for catalog.

Army-Navy "E" Flag Two Stars

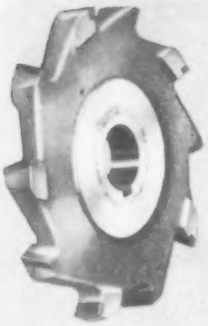
Fighter Plane Given by employees

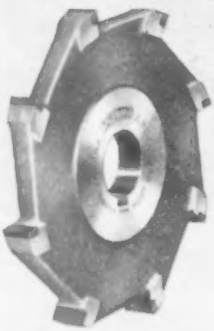
20%

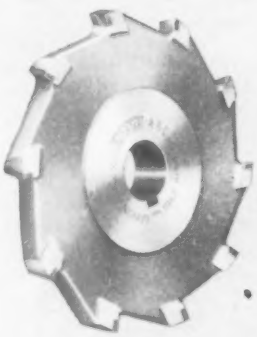
20% Employees Bond deductions

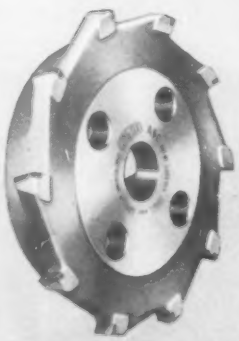
UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN









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LOWELL AND GRAYSON

FORMERLY

Grayson Manufacturing Company

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AND THE METAL IS CUT!

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This new, high-speed DeWalt will out-perform the ordinary types of "light metal" cutting machines you have heretofore been able to buy to do comparable work. It cuts metal fast, accurately, and with greater safety. *And it's built to last.*

One manufacturer, who has a battery of these high-speed DeWalts, is cutting S. A. E. 52100 solid bearing steel into $^{15}/_{16}$" lengths—at the rate of 600 to 650 pieces per hour per machine, using women operators. The machines have already cut 4,500,000 pieces *and are still going strong.*

DeWalt engineering service helped this customer step up service. What is *your* metal cutting problem? We manufacture a complete line of metal cutting machines, and may be able to help you. Call in one of our engineers. Wire, write or phone DeWalt Products Corporation, 6105 Fountain Avenue, Lancaster, Pennsylvania.

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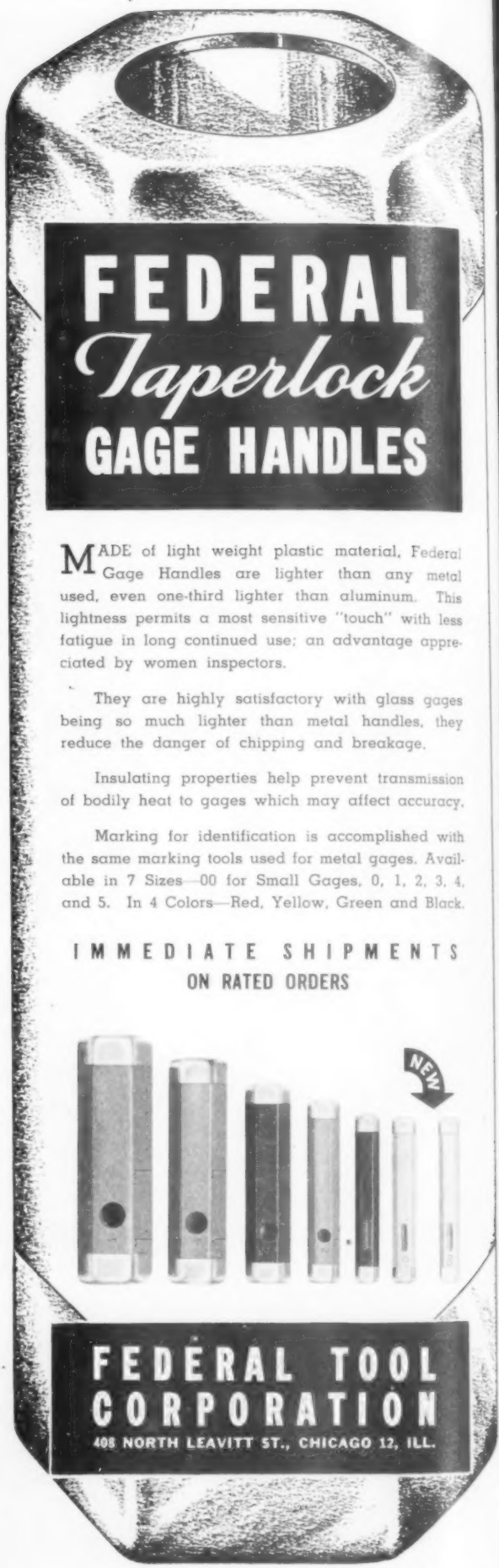

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They are highly satisfactory with glass gages being so much lighter than metal handles, they reduce the danger of chipping and breakage.

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1. **Cooler cutting** . . . Bay State's H9 vitrified bond is so tenacious that less is needed to hold the abrasive grains . . . a feature that helps wheels cut better . . . last longer.
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Bay State makes a complete line of tool room grinding wheels for every purpose . . . for cemented carbides, for tool salvage, notching, fine finishing, small surface grinding, and general cutting-off.

Where extra coolness and fast cutting is vital, Bay State's KOOLPORE wheels, with their very open porosity, are getting the call in many shops.

Bay State offers the broadest line, the most practical features; fractional grades . . . controlled porosity; the finest honing and finishing stones made; expert engineering assistance to help you get the most from grinding — "fit the grit to the grind".

Write for additional details and tables on Blue Flash Tool and Cutter Wheels. Ask for bulletin F.

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WESTBORO, MASS.

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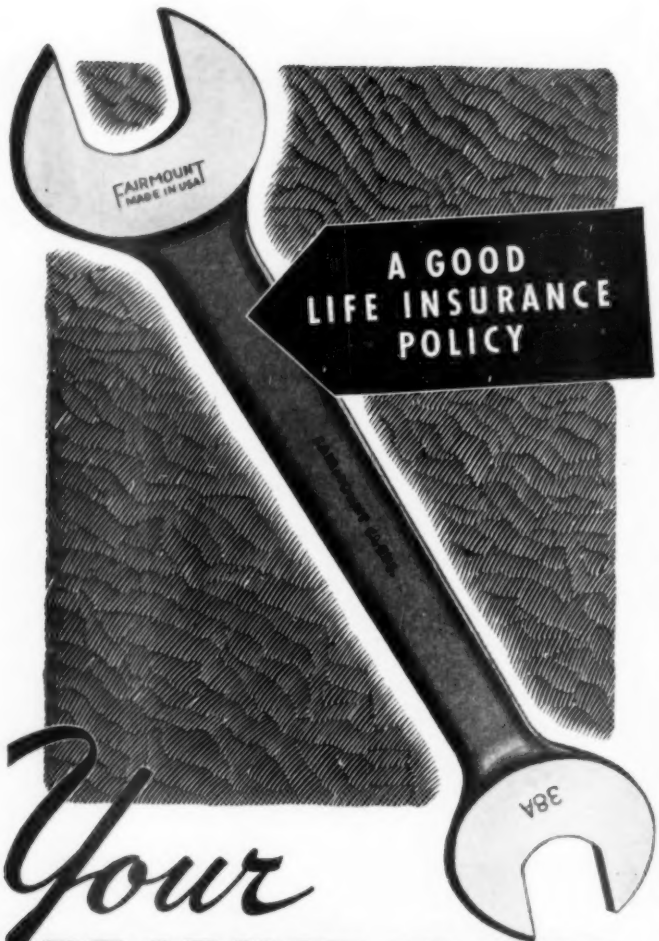
GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS



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When you equip your product with **FAIRMOUNT** Tools you are doing your part to **INSURE** its long life and maximum usefulness to the buyer. The list of nationally known manufacturers who are using **FAIRMOUNT** Tools is impressive. Don't neglect the final accessory of your product—*Specify* **FAIRMOUNT** Service Tools.

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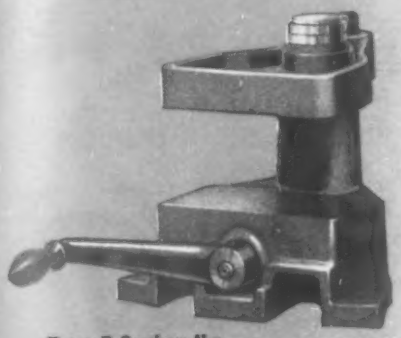
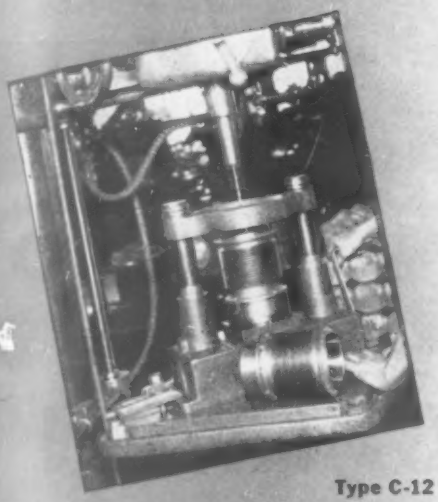
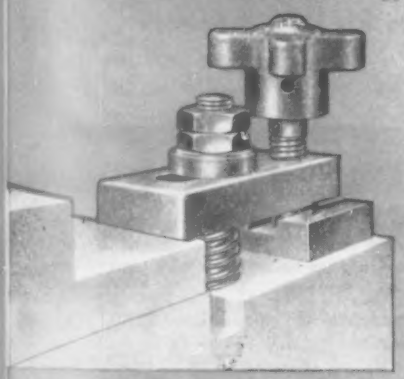
PROGRESSIVE *SHEAR-CUT* END MILLS
CLAMPS AND DETAILS



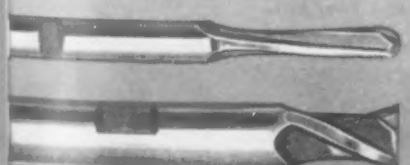
Type E Spring Jig



Type C-12 Spring Jig



No. C-40 Clamp



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Siewek Rapid Clamping Drill Jigs are quickly and easily set up. Simple, material saving adapters allow the use of standard jigs on a great variety of jobs.

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Write today for catalogs and full information on any or all of the big 3 Siewek production tools.

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***Manufacturers of* PROGRESSIVE SHEAR-CUT END MILLS**

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Standard
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SUTTON SUPER FEEDER
CUT PRODUCTION COSTS

Patented Diamond Grip Collet holds stock tightly with 10% to 15% less tension—reduces strain and wear on machine parts and tools—reduces slippage and scrap—speeds up machine cycles to tool capacity.

New Sutton Super Feeder grips stock with steel springs *in compression*—exerts uniform grip all around stock—grips larger stock area—takes round, square or hex stock.

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COLLETS

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TUTHILL HIGH PRESSURE PUMP FOR MACHINE TOOLS, ENGINES AND HYDRAULIC MECHANISMS

Here's high pressure in a compact package. Tuthill Model CK internal gear rotary pumps save space, material and money. Sizes from 1 to 50 g.p.m. Pressures up to 400 p.s.i. Direct motor drive, V-belt units and integral drives.

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High Speed Steel
18-4-1 Type

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highest grade tool steels
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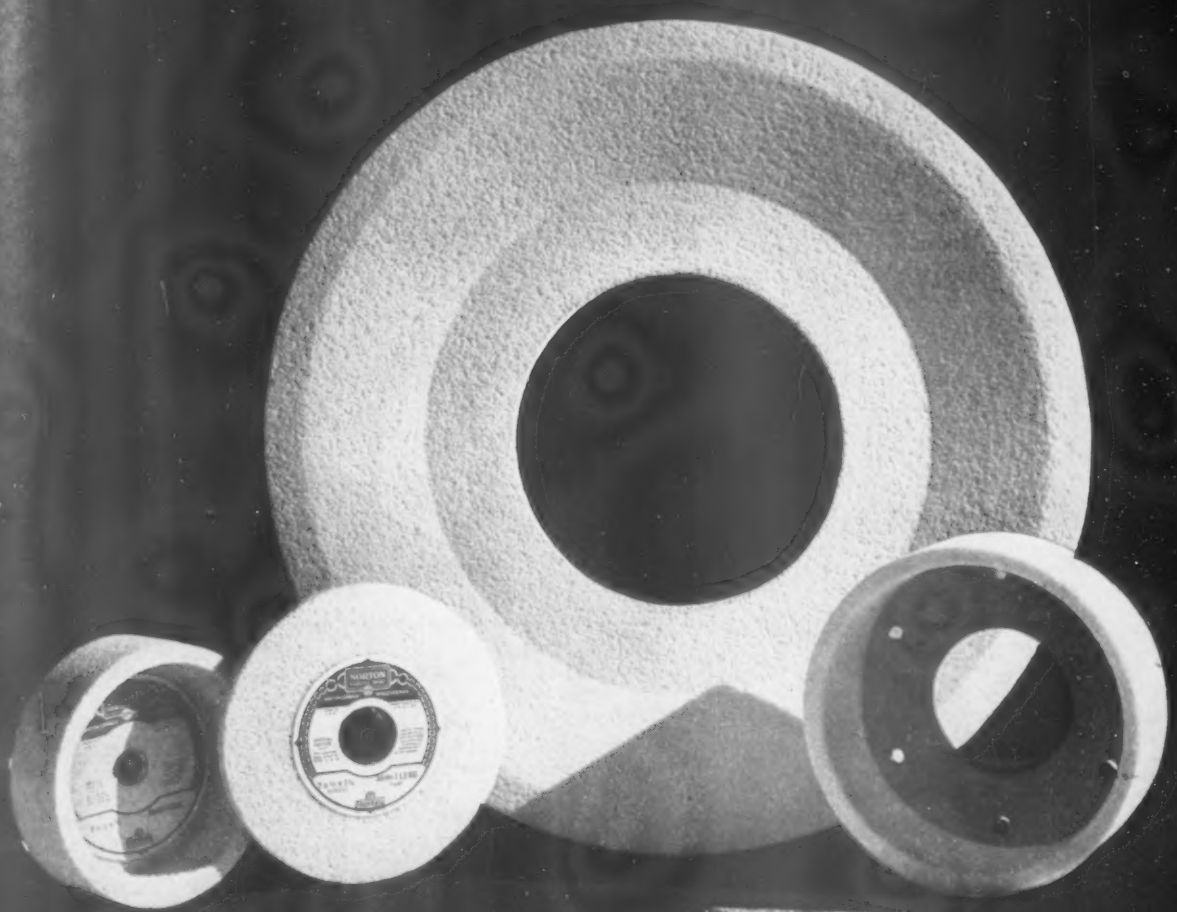
NORTON OPEN STRUCTURE GRINDING WHEELS

... Up to 24" Diameter Now



Industry now need not be handicapped by size limitations on grinding jobs that require open structure wheels—where the contact is broad—where the stock removal is especially heavy —where extra coolness of cut is essential.

Norton Open Structure Wheels are being supplied as large as 24" diameter by 4" wide and 20" diameter by 6" wide—and, of course, in all the usual tool room and surface grinding sizes and shapes, including segments.

Norton Open Structure Grinding Wheels and segments are ***uniform***—the same grinding action every time—a result of the Norton Controlled Structure process of manufacture.

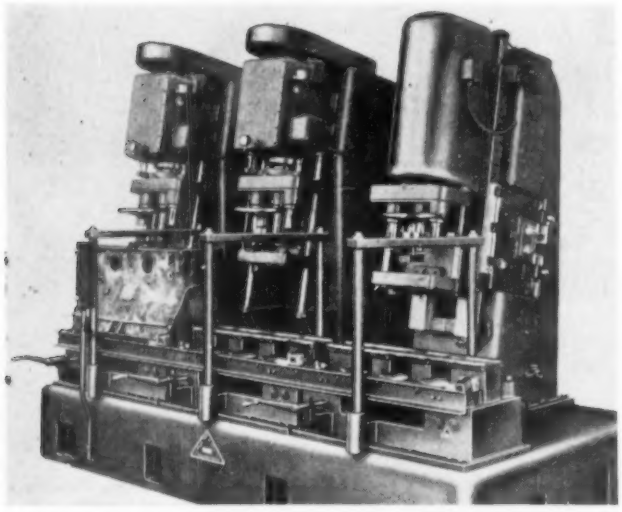
NORTON COMPANY, Worcester 6, Mass.

Behr-Manning, Troy, N. Y., is a Norton Division

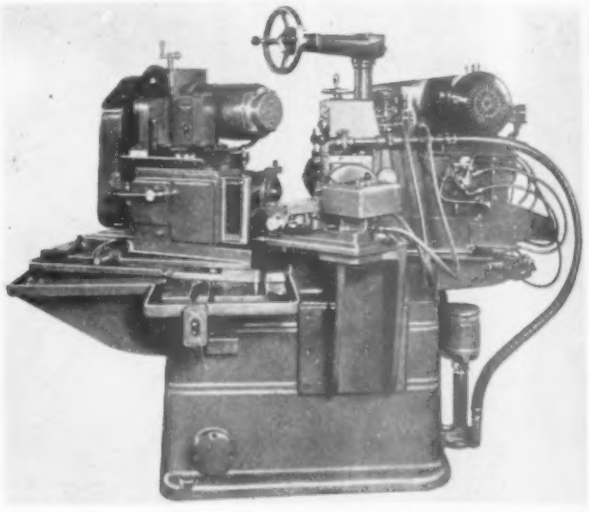
NEW EQUIPMENT

• Materials + Processing •

T. M. REG. BY THE BRAMSON PUBLISHING COMPANY



Three-station machine finishes cylinder block holes in one cycle to tolerances of .001"



Fitchburg roller bearing race grinder can be used for straight or taper production

THREE-STATION MACHINE HANDLES CYLINDER BLOCKS (P59)

Development of a three-station machine which permits rough drilling, semi-finishing and finish-reaming of huge truck cylinder blocks with a minimum of handling is announced by LeMaire Tool & Manufacturing Company.

The first station is used to drill four holes through the solid surface of the casting. Conveyor indexed, the unit then moves to station two, where a four-spindle head semi-finishes the holes. At the third station finish reamers handle two 1 ¼" and two 2" holes with accuracy of .001".

All four holes are completed in one machine cycle. Users report tripled production.

MAGNETIC SEPARATOR ELIMINATES HUMAN ERROR (P60)

The Magnetic-Automatic Coolant Separator for use on honing and grinding machines is announced as an entirely new development by the Barnes Drill Company. This separator operates without attention of machine attendant and insures a cleaned, cool supply of lubricant. Vertical and horizontal models are offered.

DRILL SHARPENER WITH DIAL SETTING SAVES TOOLS (P61)

All sizes of drills can be sharpened accurately by use of an attachment announced by Ameraco Industrial Specialties. The sharpener fits any grinder, is easily adjusted to drills for hard or soft materials and sharpens straight or No. 2 taper shank drills, it is claimed. Dial insures accuracy in measuring angles and clearances.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NECESSITY DICTATES NEW IMPROVED CUTTER SHARPENER (P62)

Faced with need for sharpening a large number of radius cutters, Hill Machine Company developed the Hill Radius Grinding Fixture, which they

Improved radius grinding fixture

claim will do the job quickly, accurately and efficiently.

The fixture includes all adjustments for radius, feed, alignment, arc and back off angle. Operation is simple and learning to use the device a matter of a short time.

The face of the wheel is dressed parallel to the table and teeth can be ground at any position.

FITCHBURG GRINDER HAS MANY USEFUL APPLICATIONS (P63)

The workhead on the new Fitchburg Roller Bearing Race Grinder is adjustable from 0° to 75° permitting use of the machine on straight or taper grinding. The machine is completely automatic. Pressing a single button starts the wheelhead through its standard automatic cycle—rapid traverse to work, proper grinding feed, spark-out time and rapid return. Fitchburg claims tolerances of .0002" are held in production.

The workhead can be arranged either pneumatically or hydraulically for collet clamping or other chucking devices.

In taper grinding application, the wheelhead is mounted on a 45° angle slide for trueing. The trueing device is side mounted parallel to the wheelhead and is hydraulically operated. There is a micrometer adjustment for positioning.

PORTABLE PUMP BUILT TO MEET SHOP EMERGENCIES (P64)

A highly adaptable, portable, self-priming centrifugal pump is announced by Brady Pump Company, Inc. The firm calls it "Pinch-Hitter". The pump can be taken to a trouble spot, attached and placed in operation in three minutes. Flexible hose eliminates use of extra piping.

PINES AUTOMATIC MACHINE HANDLES LONG LENGTH TUBES (P65)

Pines Engineering Company is manufacturing a new combination reaming and burring profiler that handles up to 6" O. D. and from 3' to 60' or longer lengths.

Head assemblies consist of spindles

(Continued on page 166)

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Request the information and service you desire and keep your library up-to-date . . .

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For your convenience these three business reply cards enable you to request quickly

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Simply fill out the card, indicating the information or service you desire, and mail.

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USE THIS CARD

for requesting new catalogs and bulletins listed in this issue.

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for requesting additional information or bulletins about new equipment, materials, processes, etc.

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Write in square, number of item describing one catalog wanted ➔ ☐

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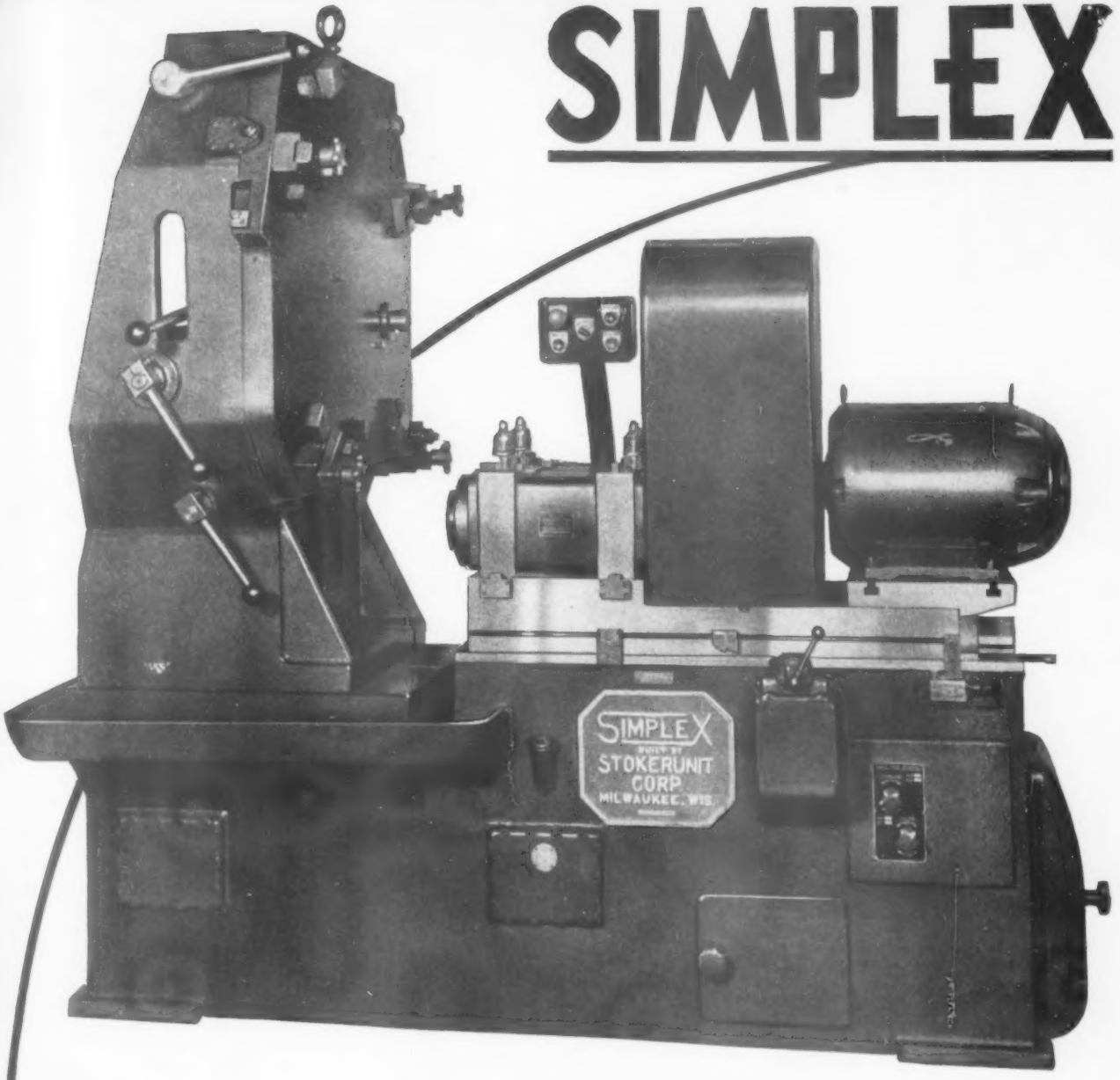
SIMPLEX



Precision Boring Machines

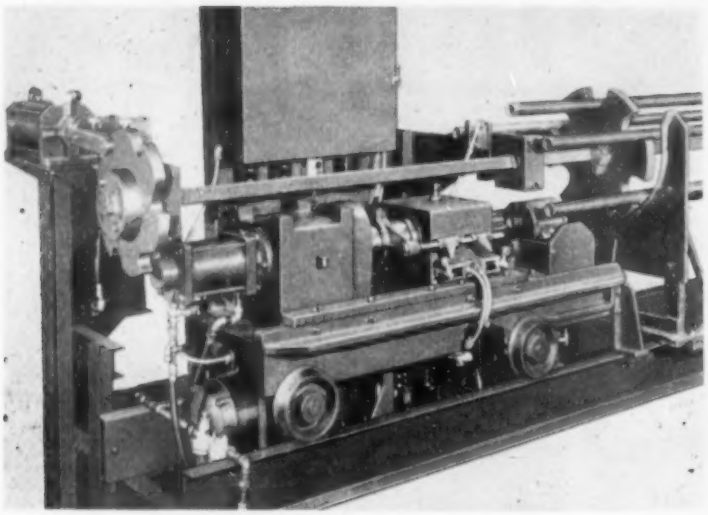
Did you know that precision boring has grown up? It is no longer confined to jobs you can carry around in your hat. Today pieces as large as your desk are being precision bored for military purposes. Tomorrow similar pieces will be precision bored for commercial purposes. Now is the time to be considering these applications in your own plant.

The machine shown above is one model. Other larger and more versatile units have been built and more are coming. Our catalogue will give you a more general picture. Our dealers will help answer your specific needs. Ask for our catalogues on your letterhead, without obligation. Our engineering surveys are available for your problems.

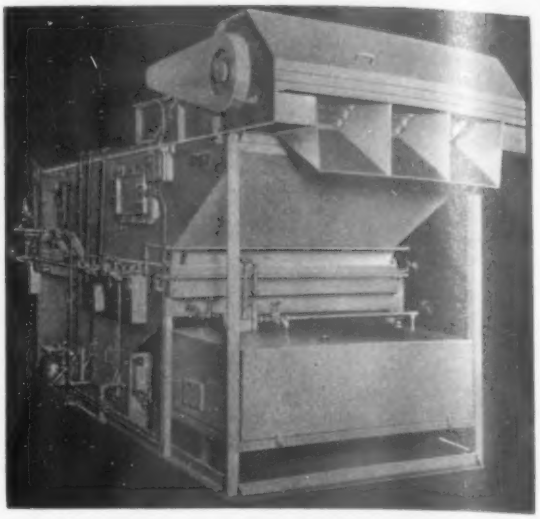
STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4528 West Mitchell Street, Milwaukee 14, Wisconsin



Automatic machine reams, burrs and profiles tubes



Degreaser offers method of cleaning small parts

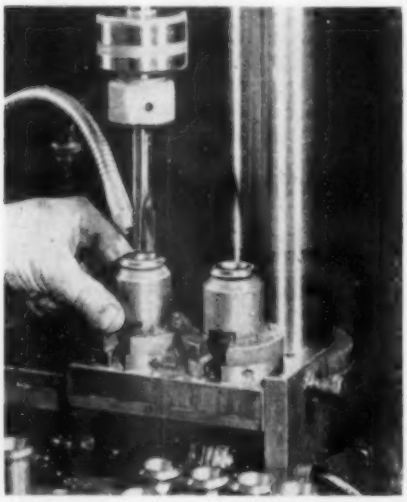
and chucks mounted on heavy cars suspended on flanged wheels which are anchored to a channel iron track. One car can be moved to position for processing any length of tube.

Tubes are fed to and from profiler by means of automatic reel feeding mechanism which selects tubes from storage rails.

Production of 200 to 400 tubes per hour on end facing and burring operations is claimed. Where inside reaming is required, production is 100 to 200 tubes per hour.

SLIDE FIXTURE ELIMINATES MANUAL POSITIONING OF PARTS (P66)

Detroit Tap & Tool Company has developed a simple, non-locking slide type fixture which they claim has speeded up precision tapping through



Fixture speeds precision work

elimination of manual positioning and use of chucks or clamps.

Use of the fixture permits continuous tapping and has reduced rejects. Another advantage is reduction of human error when unskilled employees are used. The fixture is being incorporated on the firm's light duty lead screw type tapping machines.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

BALDOR ELECTRIC REPORTS SERIES OF IMPROVED GRINDERS (P67)

Features of their improved grinder are reported by Baldor Electric Company as including an especially designed motor that is cool running under normal load and has 100 per cent over load capacity, pre-lubricated ball bearings requiring no further lubing and first grade wheels balanced with patented flanges.

TURRET ATTACHMENT SAVES TIME ON SINGLE SPINDLE PRESS (P68)

A turret attachment for small drill presses is reported by Machine Development Company. Titled Madco Turret Head, the device enables single spindle drill presses to be used for multiple spindle operations, eliminating need for gang drilling machines.

HYDRAULIC SPEEDPRESS CUTS FATIGUE FACTOR FOR OPERATOR (P69)

An entirely new air hydraulic, gap type, speedpress is announced by Studebaker Machine Company. The "Corsair" has a maximum pressure of 1¾ tons. Other models are ¾ and 2½ tons. It is easily operated by the most inexperienced employee.

BENDING MACHINES RATED FROM 50 TO 400 TONS CAPACITY (P70)

A new line of bending and straightening machines, in six sizes ranging from 50 to 400 tons for cold bending, has been announced by Thomas Machine Manufacturing Company. No heating is necessary.

FINE ADJUSTMENT HEIGHT GAGE REPORTED BY FEDERAL (P71)

Federal Products Corporation reports development of a new fine adjustment height gage with an 18" capacity. No more "tapping" is necessary to obtain precise readings, it is claimed.

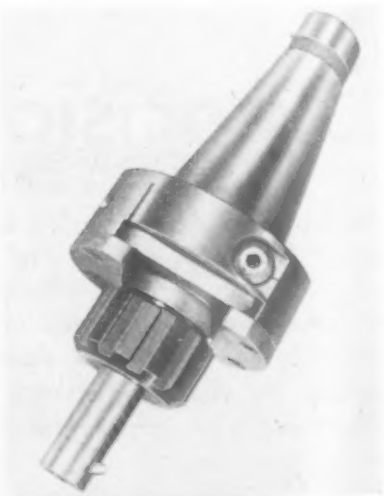
MACHINE DESIGN INCLUDES POSTWAR PRODUCTION USES (P72)

Plant conversions after "V Day" will involve many problems that will run into important time losses, Detrex Corporation believes. To reduce this time lag, designs for their line of degreasers and washers have included important details to facilitate changeover to civilian manufacture.

The firm has developed a line of degreasers to handle small parts, suitable for small automotive accessories. This line is now used to clean armament parts, but designs permit installation with minor changes to meet civilian demands when reconversion is practicable.

CHUCK HOLDS BORING BARS TO PERMIT CLOSE TOLERANCES (P73)

Universal Engineering Company reports a new chuck styled to hold boring bars. Feature of the chuck is a de-



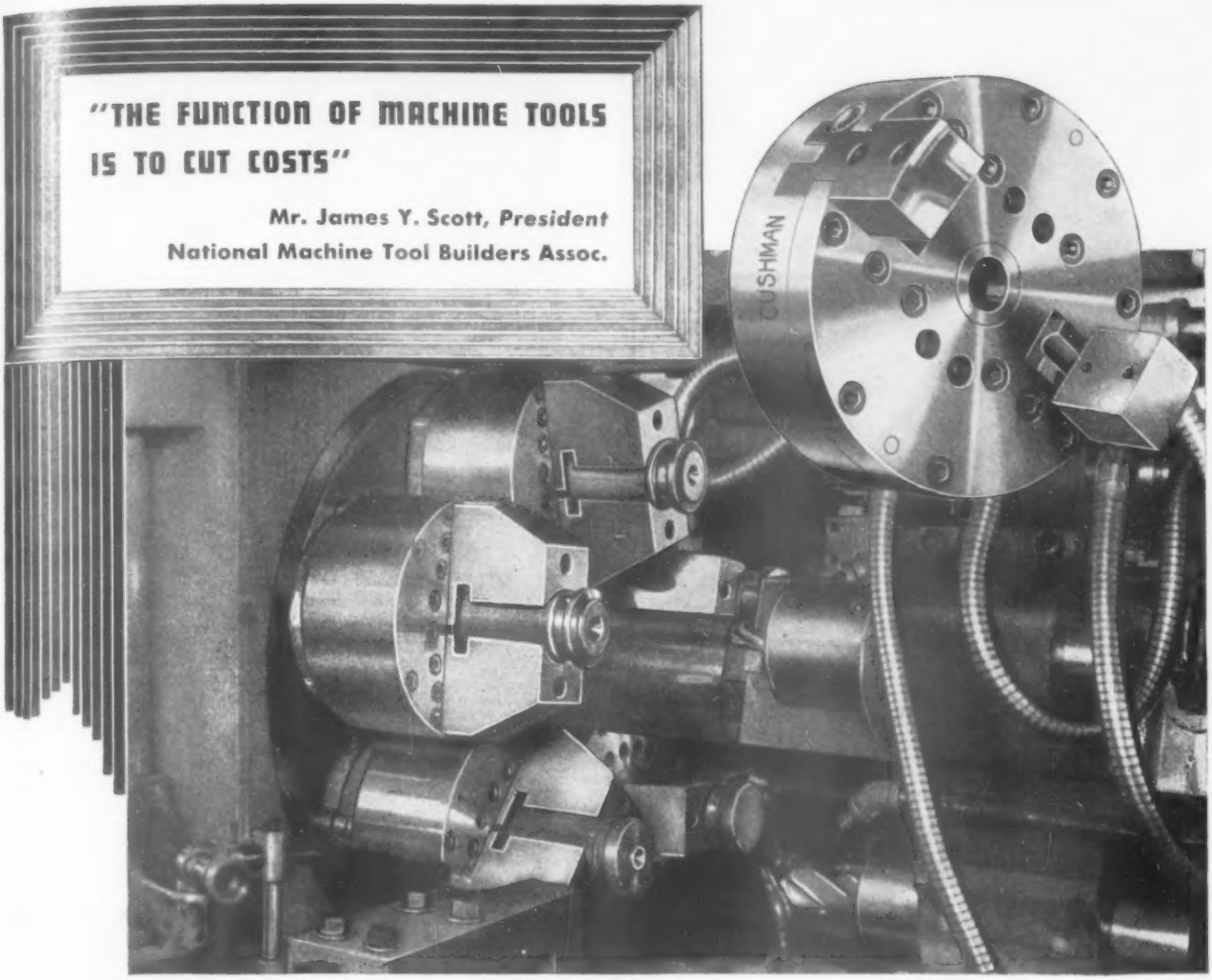
Boring chuck permits accuracy

vice to allow bar to be advanced or receded to work length. Other features are those of the Universal Collet Chuck.

(Continued on page 168)

"THE FUNCTION OF MACHINE TOOLS IS TO CUT COSTS"

Mr. James Y. Scott, *President*
National Machine Tool Builders Assoc.



and . . . THE FUNCTION OF CUSHMAN CHUCKS IS *to facilitate efficient tooling!*

The American machine tool industry has successfully met the toughest production challenge in history. But beyond this, the engineering departments of machine tool builders are also well along the road toward an equally successful solution of the production problems we will face in peace.

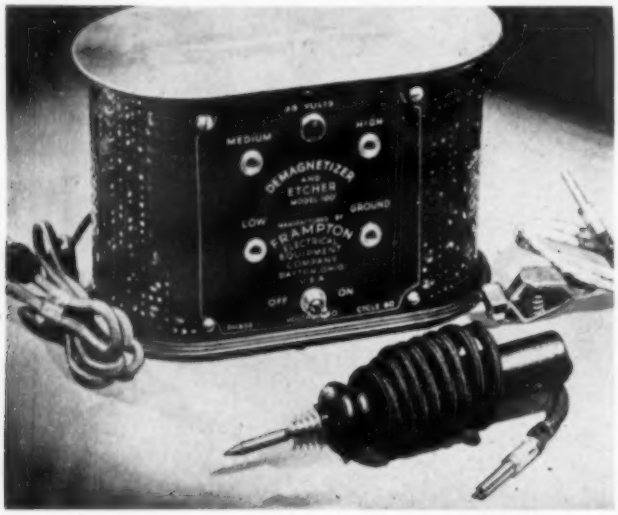
It is said that the "function of machine tools is to cut costs", and *in this function lies one of the most important keys to practical and profitable development of post-war markets.*

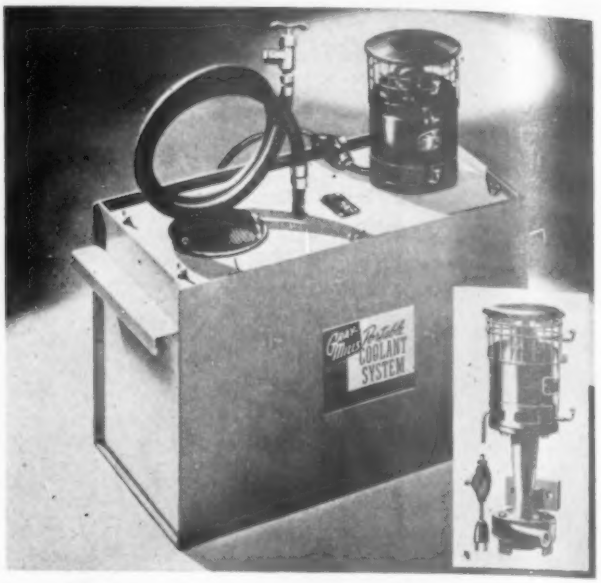
We, as builders of work-holding equipment for machine tools, are ready to take our part in the progressive developments that lie ahead, just as we are now devoting our entire production to helping speed the successful conclusion of the war.

Our engineering department is never too busy to give careful attention to forward-looking development problems. Write to The Cushman Chuck Co., Hartford 1, Conn., U.S.A.

A WORLD STANDARD FOR PRECISION

CUSHMAN CHUCKS





(Above) **Portable etcher also demagnetizes large tools**
(Right) **Coolant system can be fitted under machine**

DUAL PURPOSE ELECTRICAL TOOL ETCHES HEAVIEST STOCK (P74)

An improved type of demagnetizer and etcher is announced by Frampton Electrical Equipment Company. The new unit is portable, yet compact and sturdy, the firm says. Weight is 16 pounds.

To demagnetize any die or tool the piece is passed across poles of the unit. If large and heavy the demagnetizer can be moved across their surfaces.

Etching is performed with a pencil at three wattages.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

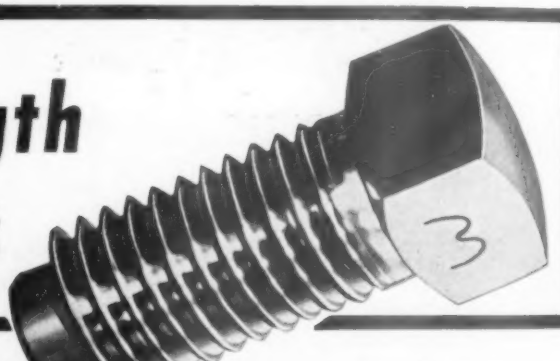
NEW MODEL COOLANT UNIT HANDLES SMALLER CAPACITY (P75)

Particularly suited to application of coolants to grinders, cutoff saws, milling machines and operations of fine abrasive cutting and honing, Gray-Mills Company announces a new model system. The model is compact and can be fitted into an out-of-the-way place. It is ready to plug in.

Forced-settling baffle plates are

(Continued on page 170)

Added Strength Saves Replacements

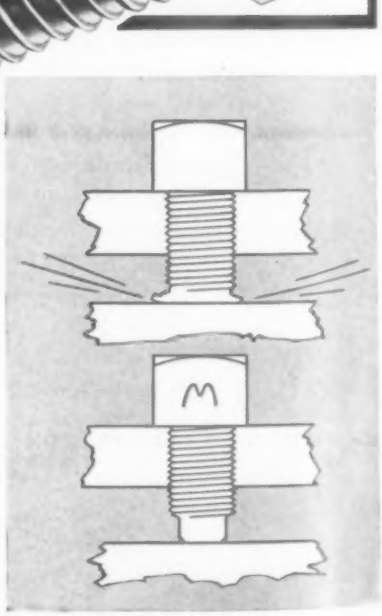


These Screws Have a Place in Your Plant

Where tremendous gripping power is necessary and projecting heads present no hazard, there is no substitute for just plain strength. Broken screws, upset points and fatigue failure can be avoided by specifying stronger screws.

Mac-its
PRONOUNCED "MACK-IT"

Mac-it Square Head Set Screws are heat-treated for maximum torsional strength and to resist upsetting of the points. A 5/8" Mac-it, for example, has a gripping power of more than 25 tons!



OTHER MAC-IT PRODUCTS INCLUDE:

Hexagon Socket Cap Screws • Hexagon Head Cap Screws • Hollow Set Screws • Hollow Pipe Plugs • Stripper Bolts

4321

Strong, Carlisle & Hammond Company • Cleveland, Ohio

How Matched Tool Steels

Reduce "downtime" and cut unit costs . . .

TOOL: Special Punch

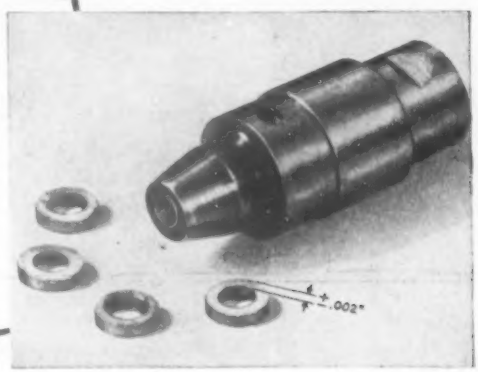
OPERATION: Punching small washer

THE PROBLEM:

Stepping up production of a washer punched from an abrasive rubberized asbestos sheet -- still maintaining close dimensional tolerances. Shutdown for regrinding necessary after only 17,000 pieces.

THE MATCHED SET SOLUTION:

By use of Carpenter Hampden (Oil-Wear) in place of a high carbon water-hardening tool steel, production time between regrinds tripled; production increased from 17,000 pieces to over 60,000 pieces per grind. Three hours tool regrind time saved daily.



● Whenever a machine or press must be stopped—output stops—and unit costs go up. The more "downtime" the higher those unit costs go.

Excessive "downtime" is often directly traceable to tools that require too frequent maintenance attention—regrinding, repairing or replacement. The example cited above indicates the benefits when "downtime" is reduced.

Many a man responsible for tools has made the discovery that much tool-caused "downtime" is unnecessary and can be eliminated—with the help of Carpenter Matched Tool Steels.

1. Because these 9 Tool Steels simplify selection—and help you get the right tool steel for maximum service on each job.
2. Because complete and easy to use heat treating instructions are furnished for each steel to safeguard hardening results and step up tool performance.

These advantages make Carpenter Matched Tool Steels easier to use in the tool rooms—and assure tools and dies that stay on the job—work more consecutive hours with less maintenance. The result is higher machine output and lower unit costs.

Carpenter Matched Tool Steels are available from conveniently located warehouse stocks. A 168-page manual provides a handy, convenient way to find the right steel for each job and supplies full and complete information on analysis, physicals, working properties and heat treatment. This manual is available from your Carpenter representative. Ask him for a copy—or write us on your company letterhead, giving position or title, please.

The Carpenter Steel Co., 122 W. Bern St., Reading, Pa.

Carpenter MATCHED TOOL STEELS

built into the tank to reduce circulation of solids. Lubrication points are readily accessible.

SEVERANCE HAS STANDARD LINE OF TINY MILLING CUTTERS (P76)

Because of their small size, Midget Milling Cutters offered by the Severance Tool Industries, are practical for finishing the most intricate patterns

Midget milling tools available

and parts in plastic, wood or metal, manufacturer says.

The cutters have ⅛" shanks. Hardened, then ground from the solid, these little tools have the same characteristics as the firm's larger tools. Available singly or in sets of 10 in a convenient kit box. Once made only on special order, the firm now reports they are available as standard items.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

FIRM ANNOUNCES IMPROVED GEAR FINISHING MACHINE SERIES (P77)

An improved line of its series of rotary crossed-axis gear finishing machines is currently in production at the Michigan Tool Company. Four basic models are included in the series.

NEW TORQUE TOOL INSURES CORRECT TENSION ON SCREWS (P78)

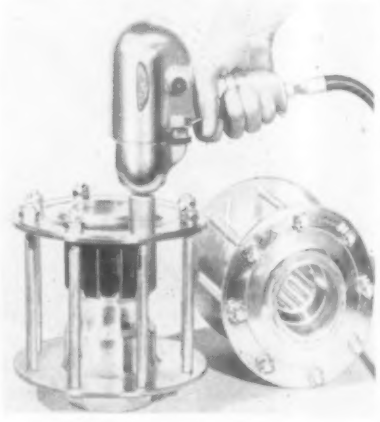
Elimination of all danger of over or under tightening, thread stripping and material damaging is claimed by Richmont, Inc., offering a new torque screw and bolt driver. The driver can be adjusted to any torque between 1 inch pound and 25 inch pounds.

SIMLOK REPLACES BOLTS IN COWLING AND PANEL DESIGN (P79)

Design and construction improvements in Simlock fasteners is announced by Simlock Division of Simmons Machine Tool Corporation. The fasteners set or release with a quick quarter-turn in use on panels and cowlings.

ARO EQUIPMENT MARKETS PNEUMATICALLY POWERED TOOL (P80)

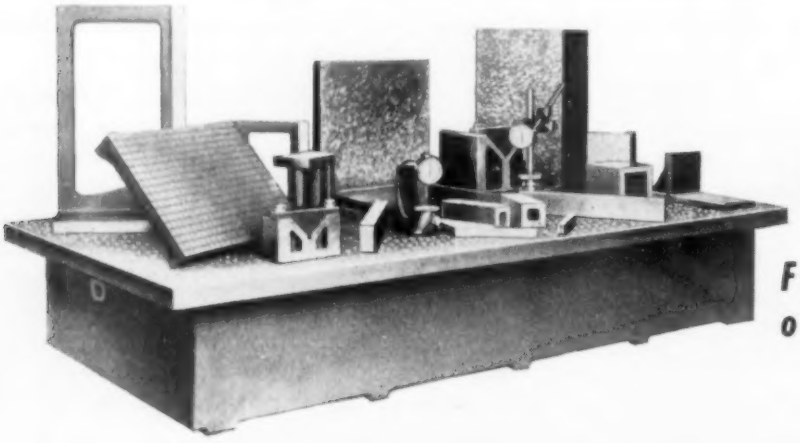
A new ⅜" impact wrench that operates with controlled torque is announced by the Aro Equipment Corporation. Designed to eliminate stretching or "burning" of threads, the tool has a calibrated adjusting screw to set any bolt or nut to pre-determined tension. It operates forward or reverse.



Torque-controlled wrench offered

Control is obtained primarily through the roller clutch impacting mechanism, a four-part device. The mechanism throws out when desired torque is obtained. Simplicity insures long life with minimum maintenance.

(Continued on page 172)



VITAL PRECISION EQUIPMENT

For the Critical Field of Close Machine Work

•

PROMPT DELIVERY

Long-life accuracy is the outstanding feature of Lombard Precision Equipment. For years this fine reputation has been carefully guarded by Lombard master craftsmen in the machining and careful finishing so necessary for equipment for inspection, tool-room, layout, assembly and general shop use.

Write for illustrated "Precision Equipment" catalog with detail listing of stock numbers, sizes and approximate weights.

SURFACE PLATES
BENCH PLATES
LAPPING PLATES
ANGLE PLATES
DIAL GAUGES
PARALLELS
V-BLOCKS
STRAIGHT EDGES

ARMY NAVY

LG LOMBARD Governor CORPORATION

ASHLAND MASSACHUSETTS

Sales Office: 60 East 42nd Street, New York 17, N. Y.

American's Complete Broaching Service

Solving Production Problems of War

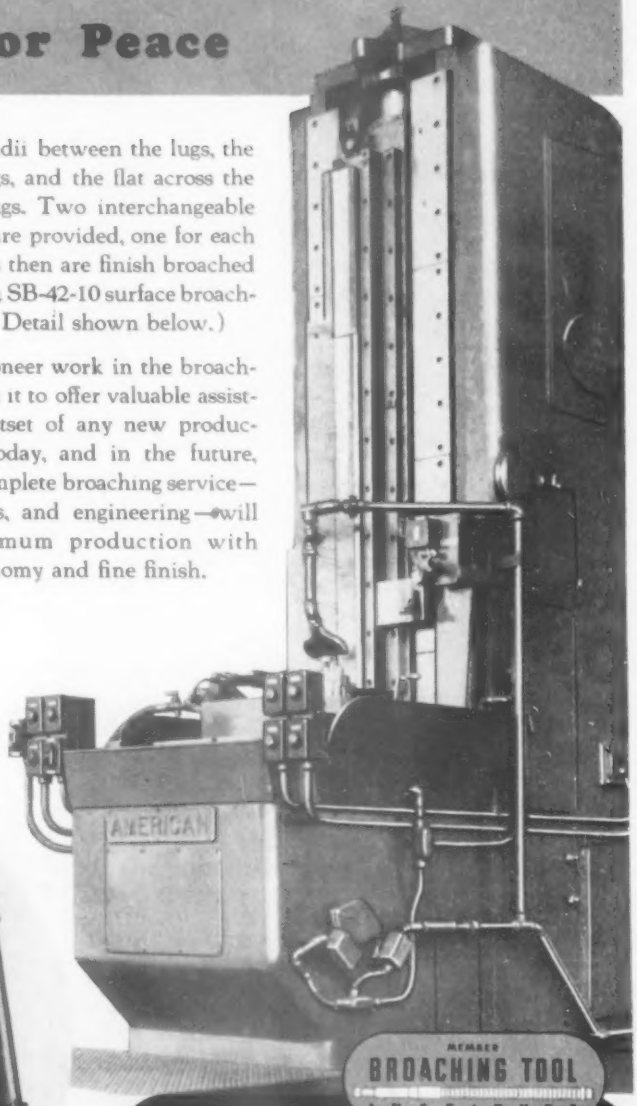
. . . Ready to Plan for Peace

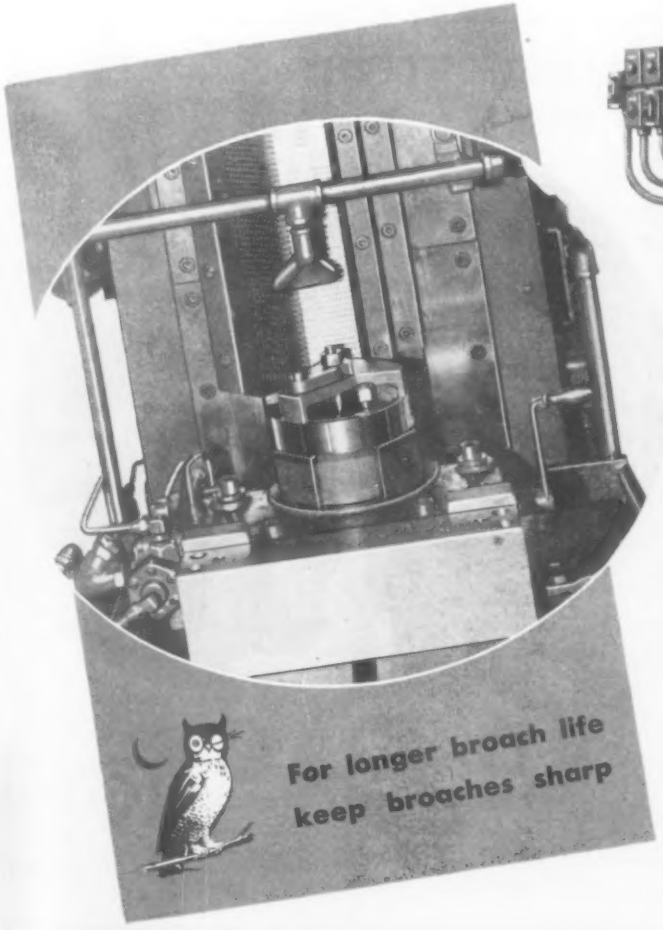
The advantages of broaching by *American* are well known to the Nation's leading manufacturers. Almost every war industry has made use of broaching, the *American* way, to secure fast, accurate, economical output.

For example, American Broach and Machine Company engineers recently designed the broach tooling and setup for the production of a new aircraft part. One operation entails the finishing of the external contour of a two-part stop sleeve.

An *American* SB-66-15 surface broaching machine (shown at the right) rough broaches the radii between the lugs, the sides of the lugs, and the flat across the index of the lugs. Two interchangeable tooling setups are provided, one for each part. The parts then are finish broached on an *American* SB-42-10 surface broaching machine. (Detail shown below.)

American's pioneer work in the broaching field equips it to offer valuable assistance at the outset of any new production effort. Today, and in the future, *American's* complete broaching service—machines, tools, and engineering—will provide maximum production with maximum economy and fine finish.





For longer broach life keep broaches sharp

MEMBER BROACHING TOOL INSTITUTE

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS U.S.A.

New comparator offers greater magnification

INSTRUMENT HAS FOUR RANGES OF MAGNIFICATION (P81)

Continental Machines, Incorporated, adds a new DoAll comparator to their line of precision gages and instruments. Basic feature of the instrument is its wider range, offering four magnification fields which detect differences from one millionth inch to .004".

Variable spindle pressure compensates for thick and thin, and hard and soft materials. Pressure is adjusted by a calibrated dial. Magnification is obtained electrically, insuring exact repeat readings, it is said.

The adjustable gage head swivels 360° in horizontal and vertical planes, allowing for checking of irregularly shaped parts of multiple jig fixtures. The gage head is removable for special applications.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

CARBOLOY ANNOUNCES NEW LINE OF SMALL CUTTING TOOLS (P82)

In line with increasing use of carbide tipped tools on small high speed precision lathes, as well as in boring bars and tool holders for fine work, Carboloy Company, Inc., has added a ¼" size tool to its line in right and left hand standard turning tools. There is a grade for steel cutting and one for other materials.

RIVET SET ALLOWS FREE HAND TO INSTALL SECOND (P83)

Operators now can safely and speedily drive rivets with one hand while installing the next rivet with the other hand, by use of a new flush rivet set manufactured by Emerson Engineering Company. This dual operation can be

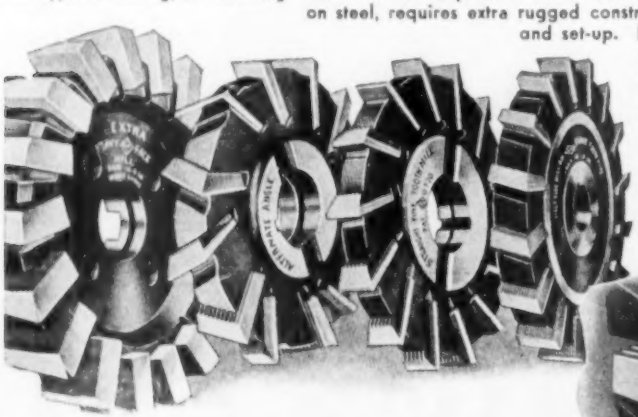
(Continued on page 174)

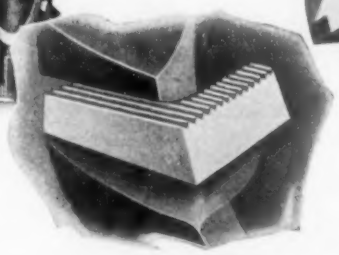
NEGATIVE RAKE & SPIRAL MILLING CUTTERS

FOR MACHINING STEEL AT HIGH SPEEDS

The O K Tool Co. not only originated Inserted-Blade Milling Cutters but also pioneered the successful adaptation of these cutters to negative rake and spiral milling.

This type of milling, a "shearing" cut from rear to point of blade which leaves a high finish on steel, requires extra rugged construction both in cutter and set-up. Extreme strength and rigidity are outstanding characteristics of O K Inserted-Blade Milling Cutters, due to the very high grade material and to the effective locking mechanisms employed.





In O K Milling Cutters, the blades are separate cutting units; the bodies are of drop-forged steel. The blades are held securely in mating serrations—always easy to adjust or renew. No pins, no set-screws, no wedges. Made in a wide variety of styles and sizes for all types of metal cutting machines.

O K Tools Are Available for Every Metal Cutting Need

TRADE OK MARK **SYSTEM**
OF INSERTED-BLADE METAL CUTTING TOOLS

THE O K TOOL CO., SHELTON, CONN.

Smooth POWER

FOR FAST, ACCURATE DRILLING

Thor AIR DRILLS

To speed your hardest shop drilling jobs Thor Air Drills have *power* and plenty of it. It's *smooth* power, too, the smooth power that makes drilling highly accurate and precise . . . that gets the job done *right* as well as fast.

You get that smooth power with Thor Air Drills because Thor's compact, one-piece construction of rotor and shaft provides deeper blade slots and wider blades . . . to deliver power in a steady, even flow.

What's more, aluminum cylinders and malleable iron housings reduce both the size and weight of Thor drills. And they have a speed governor that controls and *minimizes* air consumption . . . automatic lubrication . . . heavy duty bearings . . . and triple gearing for greater torque reserve.

For helpful information on the complete line of Thor Air Tools for all shop work, send for Thor catalog 52B.

WHY YOU GET *Smooth* POWER WITH *Thor* AIR DRILLS

Thor's one-piece construction of rotor and shaft, shown here, provides deeper blade slots and wider blades to give a smooth flow of power for faster, more accurate drilling.

Thor *Portable Pneumatic and Electric Tools*

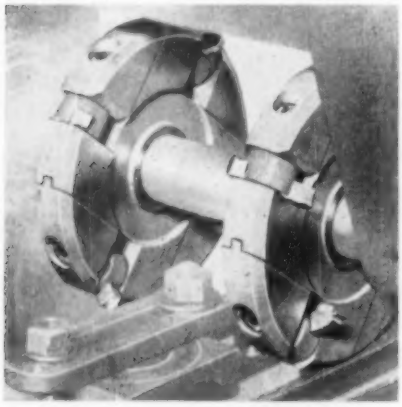
INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO, ILL.

Branches in Principal Cities

carried on without danger of flush set slipping or skidding off the rivet being driven.

The set includes a rubber ring slightly higher than the driving surface which acts as a guard and does away with possibility of marring the riveted surface. The set can be used with equal speed and safety by either experienced or inexperienced operators.



Cutter uses standard bits

UNIVERSAL FLY CUTTER LOWERS PRODUCTION COSTS *(P84)*

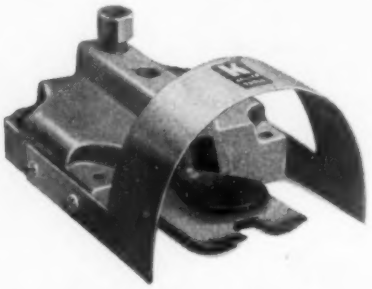
Utilizing high speed steel or carbide bits, the Newfield Universal Fly Cutter does the work of many special cutters at a reduction in time and material costs, according to the manufacturer, Newfield Machined Parts Company.

Versatile in application, this tool is used for slotting, boring, flat surface milling, straddle and form milling, gear, disc and gear cutting. It works well with light metals and plastics, as well as steel.

Standard bits of any type are inserted in holders which may be rotated 270° at right angles to the shaft, which permits individual adjustment for both width and depth of cuts.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.



Foot valve frees hands

KELLER REPORTS NEW THREE-WAY FOOT VALVE *(P85)*

A new compressed air foot valve for use with air tools, cylinders, air chucks, flash welders, air vises, riveting machines, forging machines, die casting machines and all other air operated equipment is announced by Keller Tool Company.

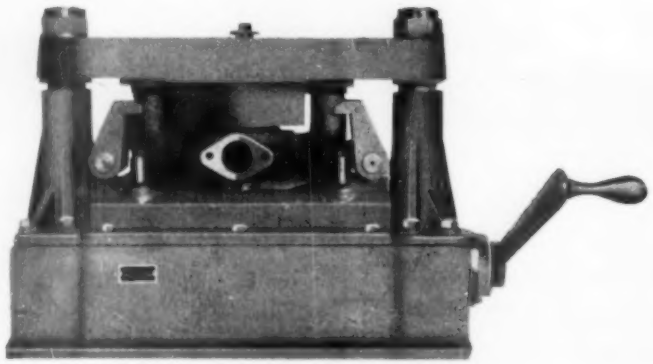
The valve frees operator's hands to facilitate rapid handling. The device is offered in locking and non-locking types. Simple valve mechanism reduces maintenance problems. A foot strap provides a safety feature.

New tool holder for large lathes

TOOL POST RIGID UNDER LOADS OF HEAVIER CUTTING *(P86)*

A new square turret tool post for use on lathes with 16" swing or larger is announced by Enco Manufacturing Company. The center post, nearly 5" in diameter, gives extreme rigidity under heavy cuts at high speed.

(Continued on page 176)



PROPOSAL L-878

Heavy duty built up type fixture drilling manifold. All locating, chucking and clamping is done by the movement of operating lever.

DESIGNERS

BUILDERS

ALL TYPES OF SHOP PRODUCTION TOOLS

STANDARD FIXTURES AND FIXTURE LOCKS

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley — **Detroit, Michigan**

ASK FOR CATALOG 941

Represented by

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Houston—Engineering Sales Co.
Chicago—Ernie Johnson
Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.
Los Angeles, Calif.—Production Tool Engineering
Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.

A PROVED TECHNIQUE IS READY

. . . FOR METALS OF THE FUTURE

Somewhere in your discussions of future production, the question of using and working the "light metals" is bound to arise. Present indications are that aluminum, magnesium and their alloys are going to find wider applications than ever before . . . and be low in price as well.

It has already been proved that slow cutter speeds and slow feeds waste time and money when you're working with the "metals of motion." The cutting characteristics of the light metals are such as to make high speed operations the most efficient and by far the most economical method of machining these metals.

For example, take an aluminum alloy aircraft spar channel beam now in production. The Onsrud Automatic Contour Milling Machine, using fast feeds, template-controlled cutter traverse, and high cutter speeds, finishes such a part in 5 minutes. It formerly required 13½ *hours* to do this job using conventional methods!

The proved technique of high-speed milling of nonferrous parts is no new story to Onsrud machines — or to the men who build them. Production men everywhere have used these machines to turn out nonferrous parts at high volume and low cost.

Keep high speed milling with Onsrud machines in mind as you plan your future production. You'll get a good idea of what to expect if you write today for bulletins on existing machines embodying the basic Onsrud principles. They tell a story it's worth money to know.

Onsrud

ONSRUD MACHINE WORKS, INC.

3927 Palmer Street, Chicago 47, Illinois

Manufacturers of Routers, Shapers, Automatic Contour Milling Machines and Related Portable Tools for Aircraft Production

MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

The block is designed to mount up to 1¼" inch tool bits or No. 2 tool holders for ⅜" bits. The indexing mechanism is self-contained to eliminate chip interference.

HOKE TYPE GAGE BLOCKS BUILT FOR LONGER SERVICE (P87)

Longer life from gage blocks used as master or working sets is offered by Lincoln Park Industries, Incorporated,

Gage blocks for long life

in their newly-offered Carbloxcemented-carbide Hoke type (square) line. Accuracy cannot be expected of gage blocks made of steel or other materials which are used continuously for comparative measurements, the firm says.

To reduce wearing, Carblox is offered to reduce the wear error in gage block build-up, to supplement and increase useful, accurate life of other gage block sets. They can be used as protective anvils and can be used as individual blocks.

Each set is attractively boxed.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

Gage has extended anvils

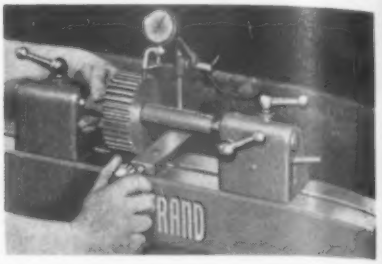
ANVIL DESIGN SPEEDS OPERATION OF INSPECTION (P88)

Extended anvil adjustable snap gages offered by Sheffield Corporation locate work easily and smoothly, resulting in reduced wear and saving inspection time. The lower anvil is extended to prolong its useful life.

Reduction of fatigue factor is claimed because of the ease of presentation of work. Stands are offered for many snap gage models. The corporation offers 25 standard models.

BENCH CENTER ALLOWS OPERATOR ADDED CONTROL (P89)

Accuracy within limits of .0001" in checking for runout on the new im-



Bench center insures accuracy

proved bench center is claimed by Sundstrand Machine Tool Company. The maker claims simplified and speedier checking in the "one-handed control" feature which allows operator one hand free to control the part being checked.

The bench center is compact and easily maintained. It is portable. Six standard sizes are offered. A dial indicator and adjustable holder are offered as extra equipment.

(Continued on page 178)

HOW AMERICAN INDUSTRY PRODUCES MORE, FASTER, BETTER — WITH BOWSER EXACT LIQUID CONTROL

WHEN BOWSER EQUIPMENT WENT TO WORK,

Regrinds Dropped from 25% to ½%

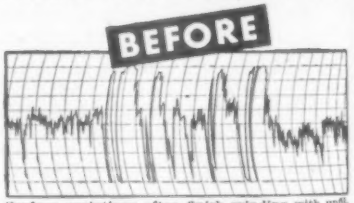
Precision gages, such as those made by Standard Gage Company, Inc., of Poughkeepsie, N. Y., and required by thousands of manufacturers in scores of industries, have tolerances as small as .00001 inch.

Standard Gage, in its grinding operations, works to .0001, after which the gages are lapped to the final tolerance. Abrasions, due largely to particles in the unfiltered coolant, were causing regrinds averaging 25%.

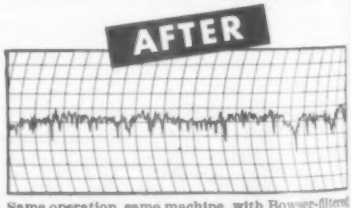
Bowser Pressure Filters were installed ... and *regrinds dropped to less than 5/10 of 1%!* Picture that in terms of savings in time, labor and money!

Bowser Filters are only one of the many types of Bowser equipment that are helping American manufacturers build more, faster, better—and usually with real money-saving.

There are undoubtedly liquid-control jobs in your plant that could be handled better by one or more of these Bowser units—Meters, Filters, Proportioners, Lubrication Systems, Pumps, Stills, Oil Conditioners. Write for information. A Bowser Liquid Control Specialist will gladly consult with you. BOWSER, INC., Fort Wayne 5, Indiana.



Surface variations after finish-grinding with unfiltered coolant prepared only 2 days previously. Scratches, scarcely visible, caused regrinding.



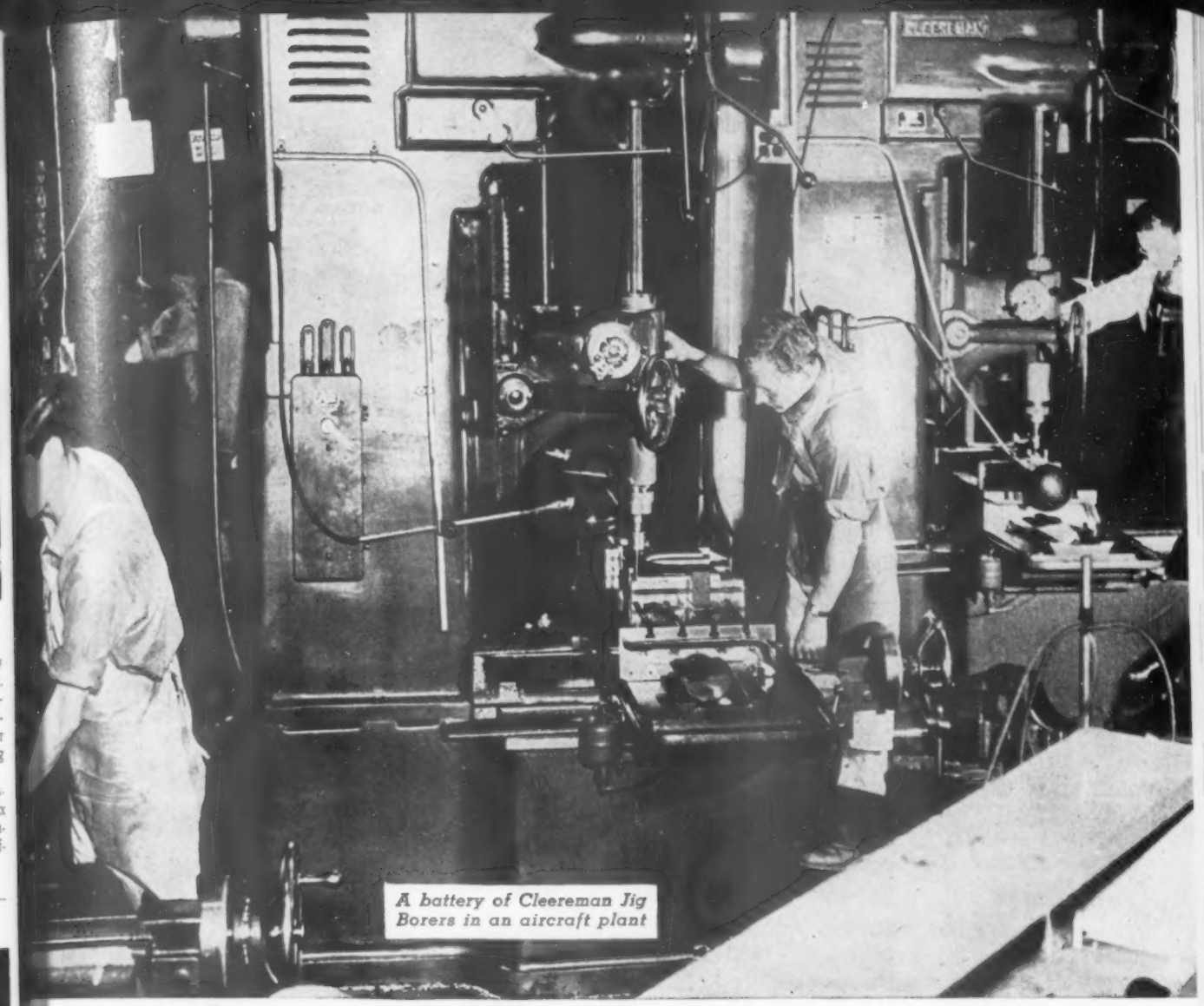
Same operation, same machine, with Bowser-filtered coolant in use 7 days. All types of grinders show similar improvement with Bowser Filters.

BUY WAR BONDS

Not only has Bowser's war production earned the Army-Navy E... Bowser equipment has helped earn it for scores of other companies.

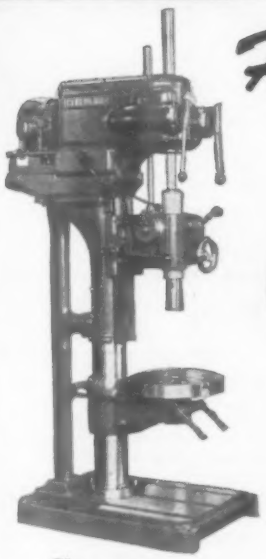
BOWSER

The Name That Means Exact Control of Liquids



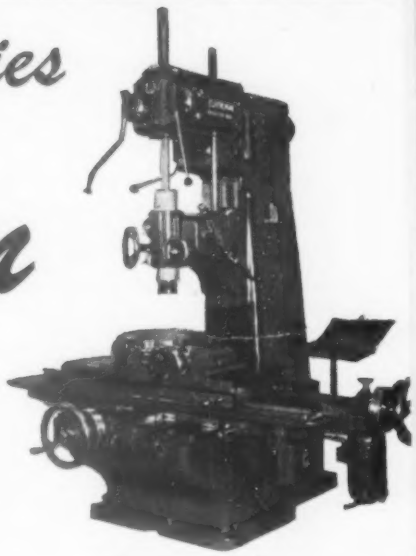
A battery of Cleereman Jig Borers in an aircraft plant

Home Front Batteries by Cleereman



Cleereman Drilling Machine

Many of America's leading manufacturers use batteries of Cleereman Drilling Machines and Cleereman Jig Borers—machines that produce faster and more accurately for war—machines that will help meet postwar competition. Write for catalogs!



Cleereman Jig Borer

BRYANT MACHINERY & ENGINEERING COMPANY

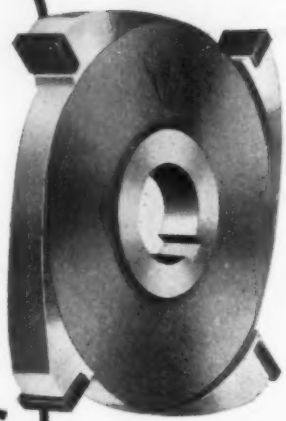
Associated with **CLEEREMAN MACHINE TOOL COMPANY**

General Sales Offices **400 W. Madison St. • • • Chicago 6 • Ill. • U. S. A.**

Again

WENDT SONIS

STANDARDIZES another group of carbide tipped tools



MILLING CUTTERS. Styles for milling cast iron and non-ferrous materials. Latest type carbide tipped tool. Diameters: 3" to 8". 4 to 10 teeth.

SPIRAL END MILLS. Right and left hand Spiral End Mills, Straight and Tapered Shanks. For cutting cast iron, steel and non-ferrous materials. Diameters 1/4" to 2".

They're here! They're new! They're standard! These Wendt-Sonis cutting tools are especially designed carbide tipped cutting tools—not adaptations of high speed steel designs.

DISTINCTIVE CHARACTERISTICS—

1. *New flute angles*
2. *New fillet designs*
3. *New shank designs*

—plus 25% longer carbide tips on all round tools. All these new tools—many of which were formerly classed as "special" are now standard and listed in new W-S Catalog No. 144. Order through your nearest Wendt-Sonis distributor . . . or write to WENDT-SONIS COMPANY, Hannibal, Missouri—or BRANCH WAREHOUSE, Long Beach, Calif.

NEW!

W-S Catalog No. 144 just off the press. Contains all new standardized tools and latest prices. WRITE TODAY for your FREE copy.

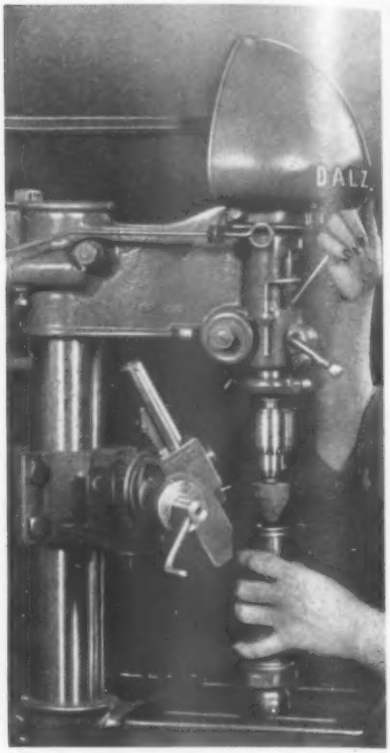
WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

DALZEN OFFERS MACHINE FOR LAPPING AND DRILL PRESS WORK (P90)

Dual purpose machines built by Dalzen Tool and Manufacturing Company perform both center lapping and drill



Combination saves floor space

press operations. Said to cost less than many single purpose center grinders, this two-in-one machine affords savings in equipment investment and in floor space.

Changeover from one application to the other requires only a few seconds. The models are light weight and completely portable.

LAY-OUT GAGE ASSISTS IN TOOL DEVELOPMENT DESIGNING (P91)

Precision layout with Mike-A-Line, a new tool marketed by Accurate Tool & Gage Company, by use of a micrometer is claimed. The device obviates use of angle and face plates. Dimensions from .001" to 2" are reported.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

TIME DELAY RELAY BUILT TO WITHSTAND MOMENTARY SHOCKS (P92)

R. W. Cramer Company, Inc., reports production of a new type time delay relay, which, it is claimed, will compensate for conditions where the relay is subjected to momentary shocks without affecting the switch circuit. A cam operated switch mechanism is the secret, the firm says.

(Continued on page 180)

SHELDON

IN THE MARINE TRADITION!

Machines and machine tools as well as men must measure up to MARINE CORPS standards before acceptance . . . must be capable of handling whatever situation arises. That is why we are proud that SHELDON LATHES were selected for the Marine Trailerized Machine Shops as well as for the Army's Mobile Machine Shop and Mobilized Instrument Repair Shop Units, and as the maintenance lathes for Navy Craft. Modern battle equipment requires precision machinery. Operation under battle conditions requires rugged, reliable and dependably accurate machine tools. In SHELDON Precision Lathes all of these requirements are fulfilled.

SHELDON MACHINE CO., INC.
4252 N. Knox Ave. Chicago 41, U.S.A.

Pioneer's war assignments are as varied as the industries we long have served. Some of our assignments are small—others will affect the course of war!

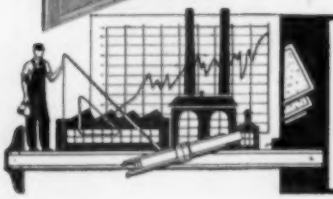
During these days, Pioneer engineers, designers and production executives are still—as in peace—the "trouble-shooting department" for many of the nation's giant firms. Yet, because we have not lost perspective, our smaller customers know they are not being shunned . . . or "pushed around."

Industry is moving swiftly into an entirely new phase of complicated problems . . . serious cut-backs . . . unexpected cancellations . . . re-conversion . . . and re-tooling for production in a sharply competitive market.

Pioneer, with its progress rooted in the bedrock of achievement, stands ready today to help industry—both large and small—with design, production, engineering and executive problems.

THE STORY OF SERVICE THAT PRODUCES MIRACLES FOR BUSINESS—LARGE AND SMALL

No Job Too Big—No Job Too Small



PIONEER
ENGINEERING & MANUFACTURING CO.
19645 JOHN R STREET • DETROIT 3, MICHIGAN

—NEW EQUIPMENT—

STEEL POLISHING WHEEL BUSHINGS REDUCE SPINDLE WEAR (P93)

Quick and easy changing of wheels without wear to spindles or risk to operators is claimed for Presto Polishing Wheel Bushings, introduced by the Manderscheid Company.

CARBIDE THREAD PLUG GAGES INSURE LONGER PRODUCTION LIFE (P94)

Jansson Gage Company announces a complete line of carbide thread plug gages. Wear resisting properties of carbide make possible continued accuracy over longer periods of time.

Gage point punch is marketed

BALDWIN LOCOMOTIVE OFFERS ADJUSTABLE GAGE POINT PUNCH (P95)

Marketing of a double-acting gage point punch is announced by Baldwin Locomotive Works. Impact force is adjustable for different materials. Four advantages are claimed: it marks four uniform centers on specimen; impact force is manually applied through adjustable detent which eliminates use of a hammer; impact and size of holes is variable with hardness of material and it automatically centers round or flat specimens.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

PRECISION GAGES BUILT TO STANDARD SPECIFICATIONS (P96)

A complete line of precision gages to meet standard and special gaging requirements is announced by Crescent

(Concluded on page 182)

Endless Rows of Tank Shoes from saws that never stop.

These six MARVEL No. 6A automatic Production Hack Saws, in the Louisville plant of the Service Welding and Machine Co., never stop except for necessary service — changing of blades, etc. Day after day on a 24 hour schedule they automatically cut 20 ft. sections of SAE 1020 Steel into multiple, 6⅞" lengths. This *is* "continuous high speed metal sawing at low cost", ***in fact.***

Each of these pieces welded to a "Z" shaped forging makes a "shoe" for an Army Tank. Before the Service Welding & Machine Co. took this contract they investigated various types and methods of "high speed production sawing" and selected MARVEL Production Saws as the most able and certain to deliver and maintain rapid, accurate production at low cost.

Write for Catalog showing the complete MARVEL System of Metal Sawing.

Buy from your local distributor

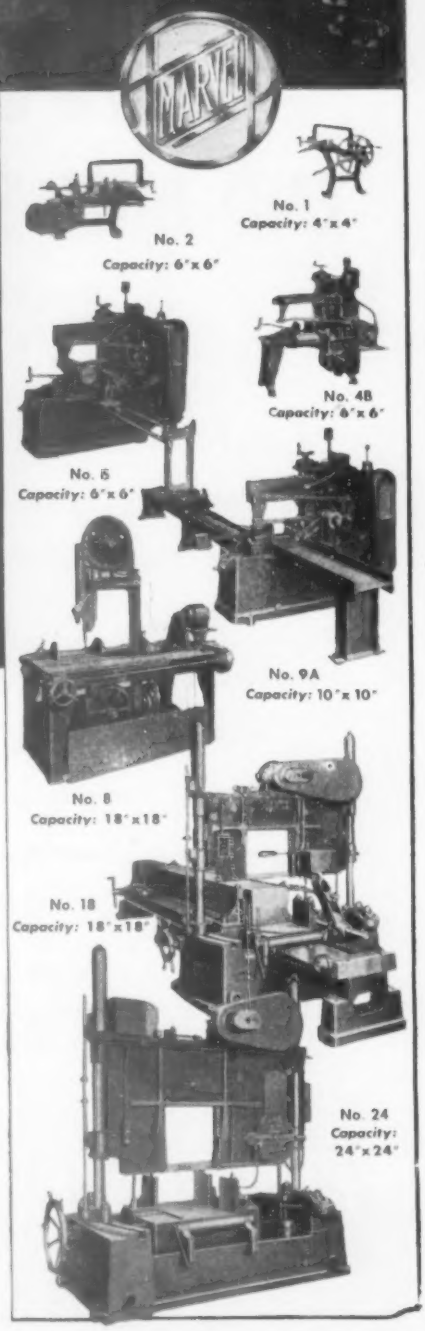
ARMSTRONG-BLUM MFG., CO.

"The Hack Saw People"

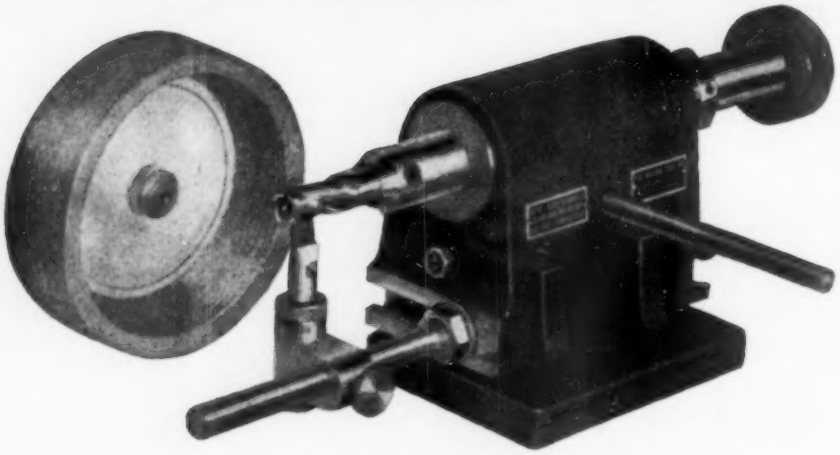
5700 W. Bloomingdale Ave. Chicago 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., N.Y. 12, N. Y.

MARVEL SAWS



YESTERDAY'S PIONEER • • • TODAY'S LEADER



WELDON
END MILL SHARPENING FIXTURE

• Get full service from your WELDON End Mills by reconditioning them with the WELDON Sharpening Fixture. Quickly resharpens End Mills from 1/16" to 2" inclusive. Requires no centers or lead cams. It is unnecessary to line up the fixture as it will always grind straight. Designed for any grinder with flat table. No table movement necessary. So simple it can be operated even by unskilled workers. Conserves tools, time and money.

WRITE FOR DESCRIPTIVE FOLDER AND PRICES

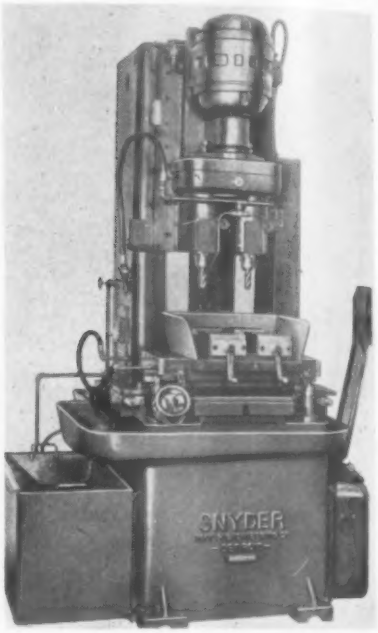
THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

—NEW EQUIPMENT—

Tool and Die Company. The line includes plug, ring, flat plug, profile, flush pin, snap and built-up gages in a full range of sizes and tolerances. Standard gages are built to American Gage Design Committee specifications.

SNYDER PRODUCES SPECIAL MILLING MACHINE FOR AIRCRAFT (P97)

Adaptation of a standard piston milling machine for use in milling of aircraft pistons and removal of stock from



Milling aeronautical parts

inside faces of wrist pin bosses is reported by Snyder Tool & Engineering Company.

A two-spindle milling head has fixed center distance requiring cutters of identical diameter. Each spindle is mounted in a quill to provide lengthwise adjustment for tool life.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

PRESS BUILDER ADDS NEW MACHINE FOR LABORATORY JOBS (P98)

A new laboratory press has been added to the Anderson line of presses. The new unit has a total capacity of 20 tons, a 5" stroke and a 12" x 20" table, accurately machined.

Power is derived from a hydraulic hand pump. In addition to laboratory uses, the press can be used for production straightening jobs, such as large sprockets, gears and plates. Weight is 400 pounds.

CALIFORNIA COMPANY CLAIMS BASIC IMPROVEMENT IN HOLDERS (P99)

Claiming the first basic improvement in tool holder design in 25 years, Robert H. Clark Company announces an adjustable tool holder that will accommodate tools of different sizes.

THE END

Working for VICTORY!

● This man, his wife, daughters and sons—millions more of them, are putting forth their best effort in the drive for Victory. Earnestly and steadfastly they are united on the home front to keep the battle front well supplied with food, ships, tanks, airplanes, guns, ammunition, etc., etc., etc. *The goal is to defeat the Axis.*

Planning for TOMORROW!

● At the Eastern Cutter plant, we, too, are working for Victory. Our facilities are devoted to the recutting of thousands upon thousands of high-speed tools of all descriptions:—

End Mills, Side Mills, Milling Cutters, Angle Cutters, Drills, Reamers, etc., — Converting Standard Tools to Special, Reclaiming worn tools, Supplying new tools, Sharpening, etc., — and contributing our bit by conserving vital steel and adding to the efficiency of many busy war plants.

● But as we work for war today, we are looking ahead, thinking and planning for the peace tomorrow. New products, better products, new skills, new machines, new tools, new ideas because of lessons learned — a new, bigger, better America to come!

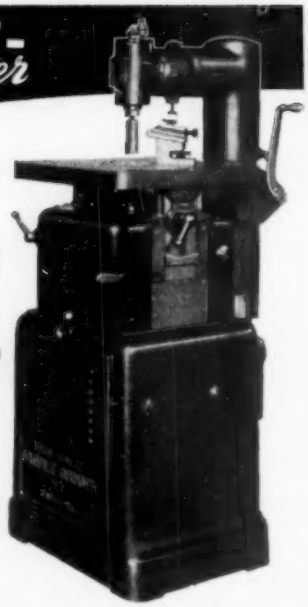
A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS

EASTERN CUTTER CORPORATION 30-32 Littleton Ave., Newark 7, N. J.

Chrome Plant MASTER CHROME SERVICE INC., 5709 Herman Ave., N. W., Cleveland, Ohio

YOU CAN DO IT—
Faster..Better



With
BOYAR - SCHULTZ
No. 2

Profile Grinder

FOR fast, accurate, economical grinding of irregular profiles, odd and difficult shapes encountered in tool and die, experimental and development work.

Both independently powered spindles operate at 10,000 R.P.M., affording rapid stock removal, even with small diameter wheels. Vertical oscillations reduce wheel wear.

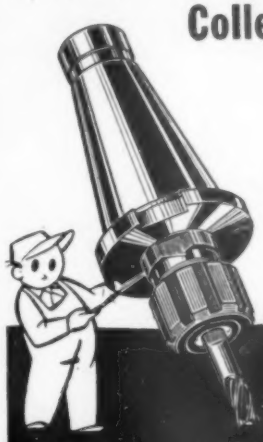
Saves time on many operations that would otherwise require hand work or costly "set-up" time on machines of other types. Made in two models—Dual Spindle as shown or with single spindle. Many users have discovered the value of this machine tool in production as well as in tool and die work.

Circular Gives Complete Description—Write

BOYAR - SCHULTZ CORPORATION

2116 Walnut St. CHICAGO 12, ILL.

Grip tools tight — with Universal Collet Chucks



Universal Collet Chuck with National Milling Machine Taper Shank. Also available with B & S, Morse and Straight Shank.

Universal Collet Chucks grip tools as strong as solid steel. Automatic release spring and allowance for tool feed-out. Handy wrench grip. Ground threads and reduced locking effort. Write for catalog.

Army Navy "E" Flag Two Stars

Fighter Plane Given by employees

20%

20% Employees Bond deductions

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

A. C. E. SPECIAL CUTTING TOOLS

Made to your blueprints with precision accuracy and fine workmanship, A.C.E. Hi-speed and Carbide-tipped cutting tools provide long cutting life. Send us your inquiries for prompt estimates. Bulletin on request.

AMERICAN CUTTER
AND ENGINEERING CORP.
31751 MOUND ROAD, WARREN, MICH.

FASTER PRODUCTION
FOR LIGHT WEIGHT AUXILIARY MOTORS ALOFT and AFLOAT

Twenty times the speed of a previous operation in cylinder dome polishing . . . at least a six-fold time saving in finishing link rods.

These results, achieved through the adoption of Brightboy Abrasives by a manufacturer of light weight auxiliary engines, are duplicated again and again when Brightboy is used for burring, finishing, and polishing. Brightboy eliminates the steps between the grind and the buff — frequently produces final polish.

Your dealer has Brightboy—and service information. Brightboy dealer representatives and service men will be glad to work with you on your production problems.

Brightboy-polished cylinder dome; Right: dome before polishing.

Brightboy-finished cylinder dome, connecting rod, wrist pin and link rod.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER COMPANY, Newark 7, N. J.

WELDON ROBERTS
Brightboy

The RIGHT gage RIGHT at hand!

NEW! Complete Precision Pin Sets to your own tolerance specifications. Efficiently and conveniently housed in strong cabinets. Up-to-the-minute help in speed production.

PRECISION Pin Sets IN SPECIAL CABINETS

Number Drill Sizes: 1 to 60
Letter Drill Sizes: A to Z 86 pins all in one cabinet
Fractionals: 1/64" to 1" in increments of 1/64" 64 pins all in one cabinet

Highest quality gage steel, heat-treated, ground to finest precision, and UPPCO lapped for the most dependable and enduring finish. Length of pins from 1½" to 2½", graduated according to diameter. Strong special cabinet, 9 7/8" x 15½" x 4½" deep, best product of cabinetmaker's craft. Walnut-finished. Brass strips with number, letter or fractional in clear white permanently fixed at each gage.

Write or wire for details. When asking prices, specify tolerances.

Mfrs. of DUBLIFE Reversible Plug Gages, and other plain plug gages of A. G. Design. Ask for complete catalog.

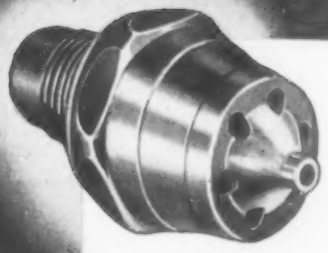
UNITED PRECISION PRODUCTS CO.
3517 West Belmont Ave.
Chicago 18, Illinois

Production Doubled Costs Reduced
SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT..

INCREASED PRODUCTION

- *Fast Machinability*
- *Improved Finish*
- *Reduced Material Costs*



Costs Reduced

Speed Case replaced a SAE 3115 steel, resulting in parts of equal excellence. Material costs reduced 50%, production increased 100% due to the excellent machinability and satisfactory response to heat treatment of Speed Case Steel.

Estimated savings per ton of Speed Case used, $73.65.

Write for SPEED CASE CATALOG. Actual shop records show savings of 20 to 65%.

OUR METALLURGISTS ARE AT YOUR SERVICE

If you wrote your own specifications for the ideal, all purpose, open hearth carburizing STEEL, it would be . . .
SPEED CASE!

BUY WAR BONDS

Licensor
MONARCH STEEL COMPANY
HAMMOND · INDIANAPOLIS · CHICAGO

Licensee for Eastern States
THE FITZSIMONS COMPANY
YOUNGSTOWN, OHIO
PECKOVER'S LTD., Toronto, Canadian Distributor
MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

NEW LITERATURE

T M REG BY THE BRAMSON PUBLISHING COMPANY

OF INTEREST TO PRODUCTION EXECUTIVES

(1107) Good Neighbors

A comprehensive catalog of machines, machine tools and cutting tools has recently been issued in both Spanish and Portuguese languages by machine and tool manufacturing companies located in the Detroit area. The catalog is laid out in sections, devoted to products of individual manufacturers. Companies interested in the venture are Michigan Tool Company, Colonial Broach Company, Genesee Tool Company, Detroit Tap and Tool Company, Tungsten Carbide Tool Company, Colonial Bushings, Inc. and New Method Steel Stamps, Inc.

(1108) Gage Wearing

Devoted to interest of manufacturer's who use precision gage blocks, Pratt & Whitney has printed a circular giving information on checking of gage blocks. The publication outlines a method of obtaining periodic checks through a system established by the company.

(1109) Central Lubrication

How centralized lubrication systems increase production with impressive savings in time, power and lubrication materials is the subject of a bulletin issued by the Farvel Corporation. The 16-page booklet treats the theory and practice of mechanical lubrication.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1110) Selenium Rectifiers

Rectifier Bulletin of Fansteel Metallurgical Corporation presents 12 pages of technical information, specifications, illustrations, wiring diagrams and ordering references on more than 130 standard Selenium Rectifiers.

(1111) Heat Control

Weltronic Company has published a technical bulletin on controls containing descriptions, applications, specifications and features of "package unit" heat controls. The bulletin announces models for virtually every resistance welding process.

(1112) Plastic Tools

"Tenite II Casting", publication of Tennessee Eastman Corporation, describes casting of thermoplastic materials for forming tools. Of particular interest to aviation companies, it should prove useful to production engineers in all industries engaged in forming of sheet metal.

(1113) Metal Castings

Meehanite Research Institute of America, Incorporated, has published a new Bulletin entitled "Meehanite Castings vs. Welded Construction". The four-page folder treats with comparisons on cast and welded fabrications for Diesel engine and press constructions. Cost and weight comparisons are included.

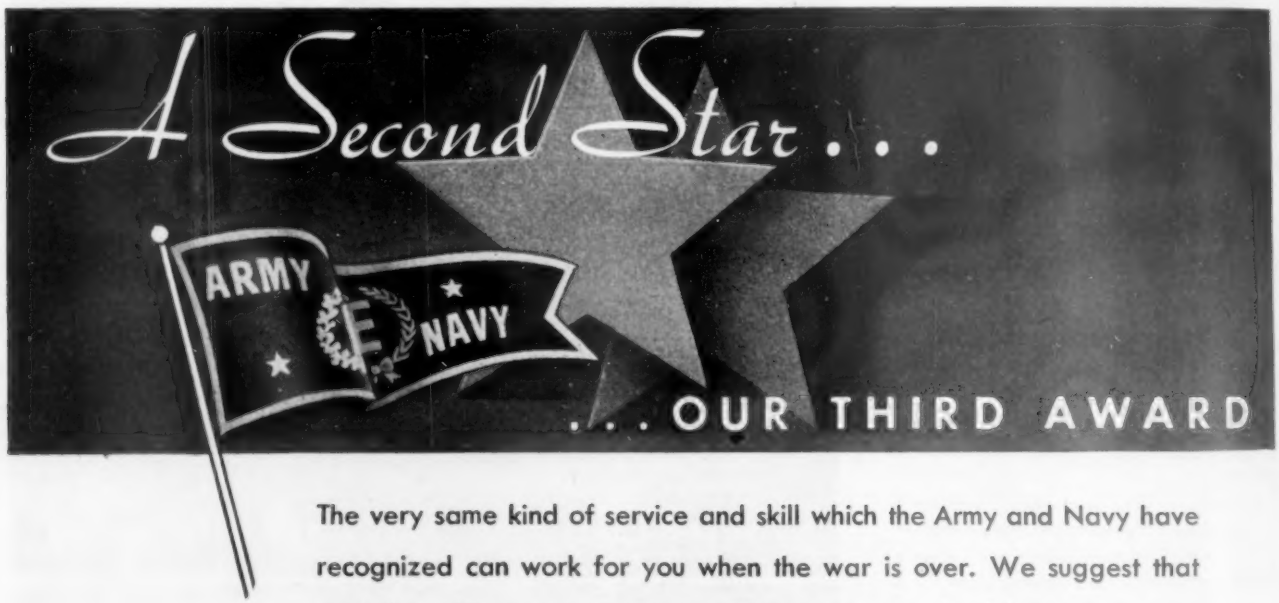
(1114) Grinding Cutters

The O K Tool Company has prepared a bulletin "Grinding Cutters" which shows in detail how to grind inserted blade milling cutters. Recommendations are made on selection of grinding wheels, clearance angles, chamfers or radii, grinding procedures, and many other useful data.

(1115) Tool Catalog

Cutting tools offered by The Weldon Tool Company are appropriately catalogued in the firm's recently re-

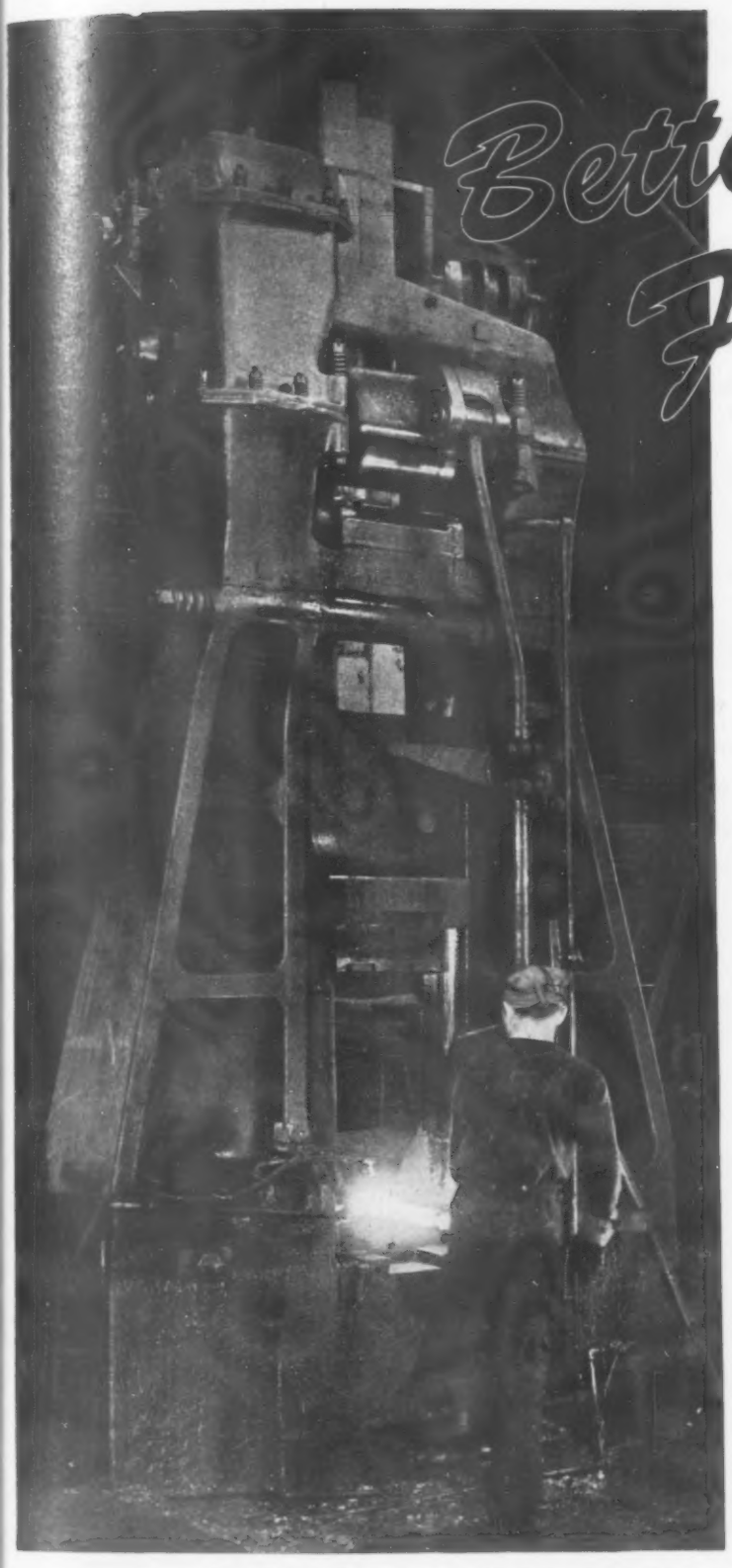
(Continued on page 188)



The very same kind of service and skill which the Army and Navy have recognized can work for you when the war is over. We suggest that you plan with us now on the precision gages required for your peacetime products. Send us your inquiries. Write for illustrated circular. Haines Gauge Company, 23rd and Allegheny Ave., Philadelphia 32, Pa.

Haines **PRECISION GAGES**

PLUG • RING • SNAP • FLUSH PIN • PROFILE • ETC.



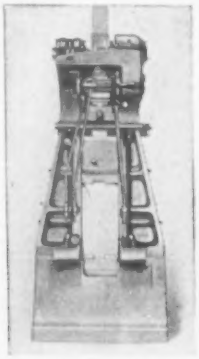
Better Drop Forgings

from Model J-2 CHAMBERSBURG Board Drop Hammer

In these war years when metal parts have been tested in the destructive jaws of the war machine and either discarded or ordered in increasing numbers, drop forgings have proved once again their essential value.

And for those drop forgings that can be made on the board drop hammer, the Chambersburg Model J-2 Hammer offers a greater degree of precision forging over a longer period of time.

Forgings made on this efficient hammer can be made to closer tolerances, are more uniform in quality and can be produced in greater quantities per hour.



Rear of Hammer showing Simplicity of Design.

The motor driven head is the acme of simplicity and quietness. The clean, well-proportioned lines of the hammer as shown in the illustration are indicative of the heavy, well-balanced anvil and frames.

Further details are described in Bulletin 252-2. Write for a copy.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

ARMY E NAVY

CHAMBERSBURG

HAMMERS · CECOSTAMPS · PRESSES

leased bound booklet "Weldon Tools". Items are illustrated by engravings, drawings and tabular matter. One section deals with special tools built to customer request.

(1116) Production Tools

Angle drills, a ball gripper drill chuck and other tools are treated in "Production Tools", publication of the R. H. Park Manufacturing Company. The aviation industry has served as proving ground for many of the items offered, the catalog says.

(1117) Abrasive Products

Divine Brothers Company has printed three companion sheets on their abrasive accessories. The sheets cover contact rolls, segment face contact rolls and buffs.

(1118) Punch Presses

The story of short run piercing economy provides subject material for "Turret Punch Presses" issued by Wiedemann Machine Company. Punch press methods for long-run identical pieces has been skillfully developed by production engineers, the firm reports. They deal with schedule-upsetting short run jobs, such as instrument panels.

(1119) Electronic Control

General Electric is circulating a folder "Electronic Control in Industry" dealing with applications of industrial electronics. The first section discusses development and utilization of electronics. Typical industrial applications are illustrated in photographs and text. Part II of the circular develops the theme of the future. Predictions are made as to general uses of the science of electronics.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1120) Cutting Tools

Special information on ground thread cutting tools and hobs is offered in a new bulletin by the Universal Engineering Corporation. The booklet deals largely with selection and uses of hobs, taps, cutters and leaders offered by the company.

(1121) Battery Welding

Answers to common questions on welding using storage batteries as a power source are contained in a new folder issued by the Progressive Welder Company. Thirty-five major questions of cost, operation, maintenance, design and installation are included with answers.

(1122) Position Welding

Advantages of welding positioning are outlined in a bulletin released by Ransome Machinery Company. Photographs show applications, general and special.

(1123) Pinion Cutting

Latest improvements on their automatic pinion cutting machine are described in a pamphlet circulated by E. F. Hager & Son. For extremely small production units a microscope attachment is offered.

(1124) Hydraulic Press

Reduced costs for metal working are advanced by the Hydraulic Press Manufacturing Company in a descriptive circular "Faster Speeds". The firm is looking toward 194X production goals and advises that costs can be reduced through use of hydraulic equipment.

(1125) Welding Hints

Helpful hints to welding are contained in a publication of Hobart Brothers Company, entitled "Welders' Vest Pocket Guide", photos, charts, diagrams and cartoons show the way to successful welding.

(1126) Cutter Catalog

Kennametal, Incorporated's catalog, new and enlarged, is available. Several new features have been added and the material so organized as to save time in locating needed cutting tools. Among new sections is one dealing with Kennametal-tipped milling cutters.

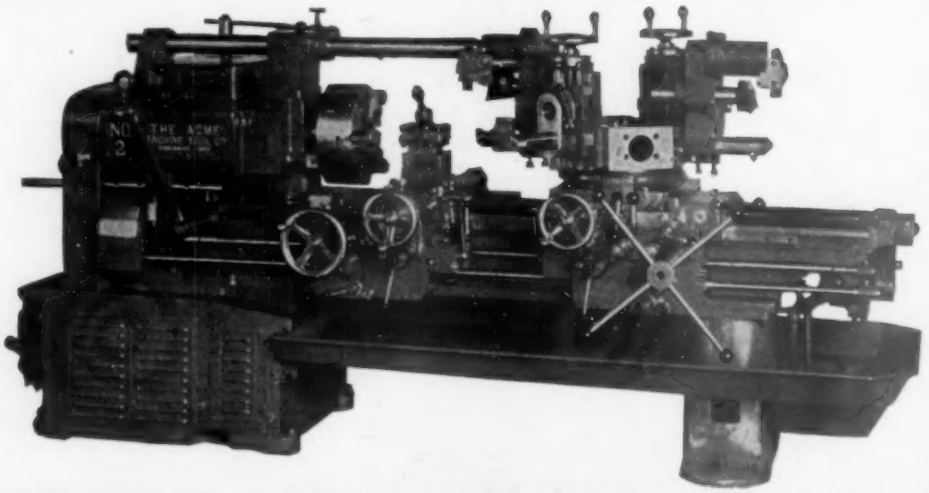
(1127) Railway Precision

Data sheets for obtaining exact work in railway maintenance comprise the "Railroad Shops", a publication of Giddings & Lewis Machine Tool Company.

(Concluded on page 190)

CINCINNATI
ACME
UNIVERSAL
TURRET LATHES

SPEED PRODUCTION--SAVE TIME



GREATER RIGIDITY AND ACCURACY UNDER HEAVIER CUTS AT FASTER SPEEDS!

The above illustrated No. 2 ACME Universal Turret Lathe with its stationary overhead pilot bar and headstock brackets together with rigid turret tooling permits heavy multiple cuts. These features assure accuracy while faster speeds are possible through the use of cemented carbide cutting tools. This machine features heavy duty multiple turning heads and vertical side tools and heavy duty reversible cutter holders. Also shown is the lead screw type chasing attachment with split nut brackets and threading dials on both carriages. • WRITE FOR COMPLETE DETAILS.

THE ACME MACHINE TOOL CO. 4955 SPRING GROVE AVE., CINCINNATI 32, OHIO

DEPENDABLE..
.. so are Morse Tools
That's why so many manufacturers have found that Morse Tools reduce costs.
TOOLS ARE WEAPONS
TREAT 'EM RIGHT

MORSE

THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

SAN FRANCISCO STORE: 1180 FOLSOM ST.

The illustrated booklet is a mine of information on machine settings, mountings and operations on typical problems. Machine shortcuts have been devised to save time and materials.

(1128) Foundry Ovens

The Despatch Oven Company offers a new bulletin covering 48 standard models of foundry ovens available with gas, oil or electric heating systems. Claims for the improved designs are increased production, more convenient handling and lower fuel consumption. Models are offered for large or small foundries.

(1129) Lapped Gears

A method of gear lapping to provide a final correction for heat treat distortion and grinding roughness is described in a bulletin of the National Broach & Machine Company. Modern specifications cause scrapping of many parts that can be reclaimed through use of a two-spindle lapping machine, the pamphlet points out.

(1130) Carbide Reamers

Whitman & Barnes offers "Carbide Tipped Tools", a folder describing tipped chucking reamers. Straight and taper shank reamers are included in the listings.

(1131) Surface Protection

Properties of heat reflectance are discussed in "New Approaches to Surface Protection" issued by Preferred Utilities Manufacturing Corporation. Described are methods of putting radiant heat energy back to work through application of protective coatings. Charts show relative reflectance of various colors.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1132) Precision Tapping

A descriptive bulletin on a precision tapping attachment has been prepared by the Douglas Machinery Company, Incorporated. The manufacturer claims the attachment has advantages over machines in that it eliminates a separate operation.

(1133) Cutter Information

Ordering information is included in a bulletin of the American Cutter & Engineering Corporation. The publication illustrates cutting tools and offers suggestions on care and upkeep.

(1134) Cleaning Problems

Twin booklets edited by Detrex Corporation cover special metal cleaning problems. "Solvent Degreasing and Effective Methods of Conserving Chlorinated Solvents" contains 16 pages of time and material saving wrinkles. The second bulletin treats with the firm's alkali cleaners in eight pages of illustrated uses.

NEW BOOKS

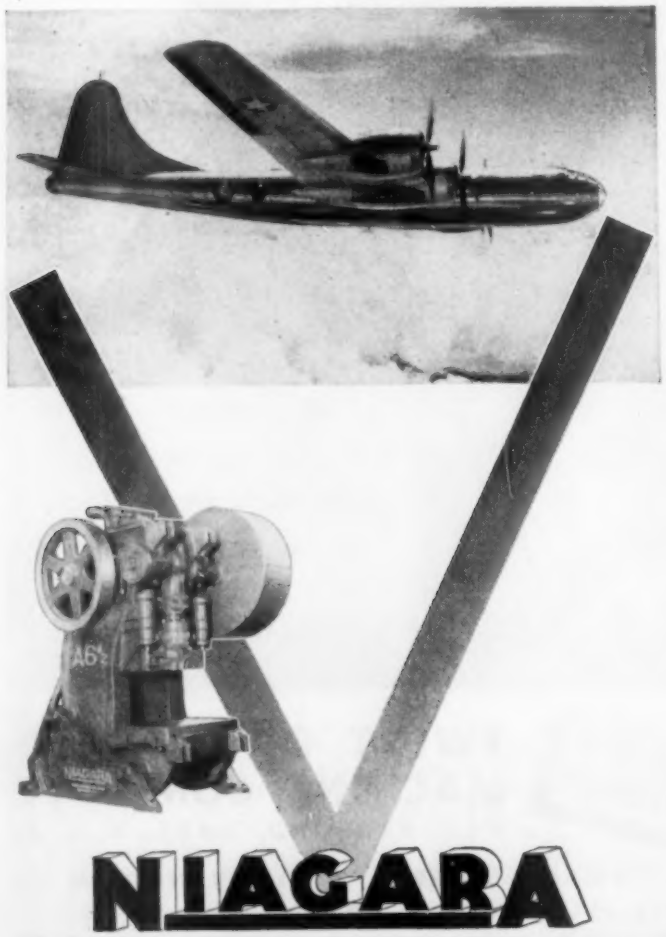
Spur & Helical Gear Problems. Walter E. Dalby, author and publisher. Price $1.50.

Divided into four sections this 57-page manual presents spur, helical and special gear problems through use of simplified tables and solved examples. The spur and helical sections include charts, with theoretically-correct solutions, for determining dimension over pins for spur gears and balls for helical gears and for determining tooth thickness when dimension over pins or balls is given. The special gear section contains solutions to problems and charts particularly useful in designing multiple drill heads.

* * *

Universal Cutter and Tool Grinding Operator's Instruction Manual, Book C, Covel Mfg. Co. Price $1.00.

While written primarily for operators and especially for apprentices to aid them in the art of toolroom grinding, this handbook contains valuable data and tables. It also contains useful information for production executives. The book is a complete treatise on cutter and tool grinding and is well arranged with a technical index for ready reference. It discusses grinding machines, adaptability, grinding wheels, methods of setting up milling cutting tools for grinding and other important information.



★

The production lines of American Industry are behind the battle lines of the United Nations. Batteries of Niagara Presses and Shears are speeding up production of America's SUPERFORTRESS—Fastest of Bombers. High output, convenient operation, reliability that reduces shut-downs to a minimum are performance factors resulting from Niagara design.

Niagara Presses and Shears are built in a complete range of well graduated sizes.

Write for Bulletins.

★ **Buy U. S. War Bonds** ★

★

NIAGARA MACHINE & TOOL WORKS

BUFFALO 11, NEW YORK

District Offices: Cleveland, Detroit, New York

WORLD'S LARGEST LINE OF

Pneumatic Wrenches

(IMPACT TYPE)

Few parts . . . low maintenance

Speedy...powerful...CP Pneumatic Wrenches (Impact Type) will remove nuts, bolts, studs—or apply them—in a fraction of the time required to do either job by hand. Available in six sizes to handle bolts, nuts, lag screws, studs. Illustrated above is the popular CP 365-RP, for bolts, nuts, etc., up to 1¼" bolt size.

SPECIAL FEATURES OF CP PNEUMATIC WRENCHES
(Impact Type)

No Springs — No Gears
Few Parts — Low Maintenance
"Smooth-Flow" Clutch
Absence of Torque Reaction
Slow Speed — Long-Life Motor
Easy to Dismantle and Assemble
Perfect Balance — Easy Handling
Short Length — Light Weight
Angle Types Available in Capacities of ¼", ⅜" and ⅝" Bolt Size

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

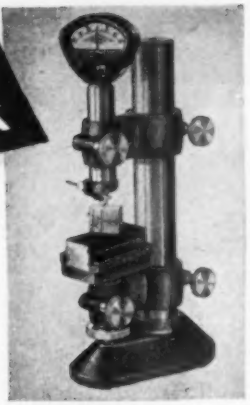
CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

MIKROKATOR

"MIKRO" (MINUTE) FRICTIONLESS AMPLIFICATION



POSITIVE, DEPENDABLE REPEAT READINGS

•

NO friction, lag or backlash . . . no racks, pinions, gears, levers, etc. subject to wear. Pointer responds instantly without swinging past true reading. Amplification is 100% mechanical, no lights or electromagnets, no warming up period required. Easily moved to different locations as there are no electrical connections. Our engineering department is at your service for applying Mikrokator to your measuring problem.

Graduated — .0001" to .00001".

Graduated — .001 mm to .0002 mm.

•

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SWEDISH GAGE CO., OF AMERICA

8900 ALPINE AVE., DETROIT 4, MICH.

IMMEDIATE DELIVERY

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AUTOMATICS

Acme, 9/16" Model C, 5 spdle, M.D.
Cleveland, 1, 1½, 2½, 2¾ & 3⅜" Model A
Cleveland, ⅞, 1½ & 2½" Model B
Cleveland, 1¼ & ½" 4 spdle, Model M
Gridley, 2¼, 3¼ & 4¼" S.S.M.D.
Gridley, 9/16, ⅞ & 1¼" Model G, M.D.
Gridley, ¾, 1¼ & 2¼" Model F, M.D.
Potter & Johnston, No. 5A & 6A M.D.

GEAR MACHINERY

Barber-Colman No. 3 & 12 Hobbers
Fellows Shapers, No. 6 & No. 7 H.S.

GRINDERS

Blanchard No. 16A R.S. with 30 x 18" Magnetic Chuck, 30 H.P. A.C. Motor
Landis 6 x 18 & 10 x 36" Landis Plain, M.D.
6" x 32" Norton Plain, M.D.
Pratt & Whitney No. 14 Surface, M.D.
Webster & Perks, 10" x 30" Universal

LATHES

Hendy, 12" x 5 & 6' Geared H'd, M.D.
Warner & Swasey Turret No. 2 & 4 M.D.

MILLING MACHINES

Becker Vertical No. 5 & 6—Model C
Becker Vertical, Model SD, 40" Rotary Table
Brown & Sharpe No. 2 Universal

USED & REBUILT

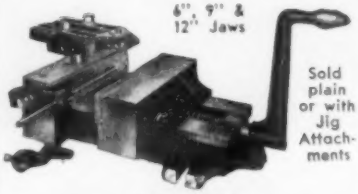
MACHINE TOOLS — POWER PRESSES

OTT MACHINERY SALES INC.

546 Second Ave. — Detroit 26, Mich.

Phone: Cadillac 3103

ADAPTABLE TO HUNDREDS OF JOBS



GRAHAM MULTI-PURPOSE VISE

With its many special jaws, drill guides, stops, etc., etc., this vise is always widely useful, whether under wartime or peacetime conditions, as a jig or fixture for drill press, planer, shaper, radial, miller, grinder. Sizes from 124 lbs.

KNURL HOLDER FITTING LATHE TURRET

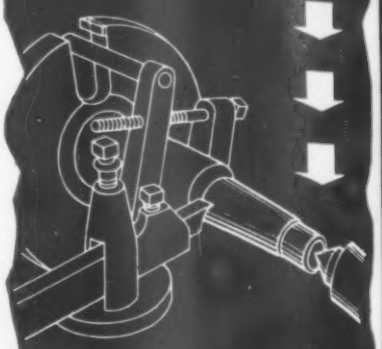
Its "Adjust-angle" feature enables you to produce many patterns of straight, spiral and checkered knurlings using only straight knurls. Handles work up to 2½" dia.

Request Illustrated Price Circulars

GRAHAM MFG. CO.

79 Bridge St. — East Greenwich, R. I.

FOR FREEDOM FROM FRICTION



on the DEAD CENTER

DIXON'S LATHE CENTER GRAPHITE LUBRICANT... combines lubricating flake graphite with an extreme pressure lubricating compound. It possesses almost super-film strength. As a result of these advantages, it reduces the chances for overheating, reduces wearing or scoring of dead centers, steady and follower rests and jack screws.

Assures more accurate work.

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.

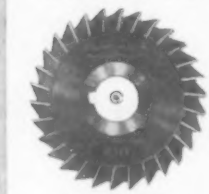
Canada: Canadian Asbestos Company
Montreal • Toronto • Vancouver • Winnipeg

Pipe Joint Compound · Graphite Seal · Graphited Oil
Cup and Pressure Gun Grease · SlipStik
Gear Lubricants · Waterproof Graphited Grease
Auto-Marine Grease · Industrial Oven Lubricant
Graph-Air Guns · Lathe Center Graphite Lubricant
Welding Rods · Bolt Dressing (Contains no Graphite

Ⓡ Metal Slitting Saws

Majority of Sizes Available for Immediate Delivery!

Hollow Ground Saw



Side Chip Saw

Staggered Teeth Saw

Slitting a surface grinder front spindle bearing (shown above) is only one of countless operations performed by these Circle R saws.

The Circle R side cut slitting saw is designed to take deep cuts, split chips and eliminate dragging while the Circle R Slitting Saw, with staggered teeth, is for use where deep cuts or heavier feeds are required. The shearing action of the peripheral teeth and more chip clearance on the sides give this latter saw an advantage over the regular side chip clearance.

For complete details and specifications on these and other Circular Saws, send for Catalog K.

CIRCULAR TOOL CO., Inc.

PROVIDENCE 5, R. I.

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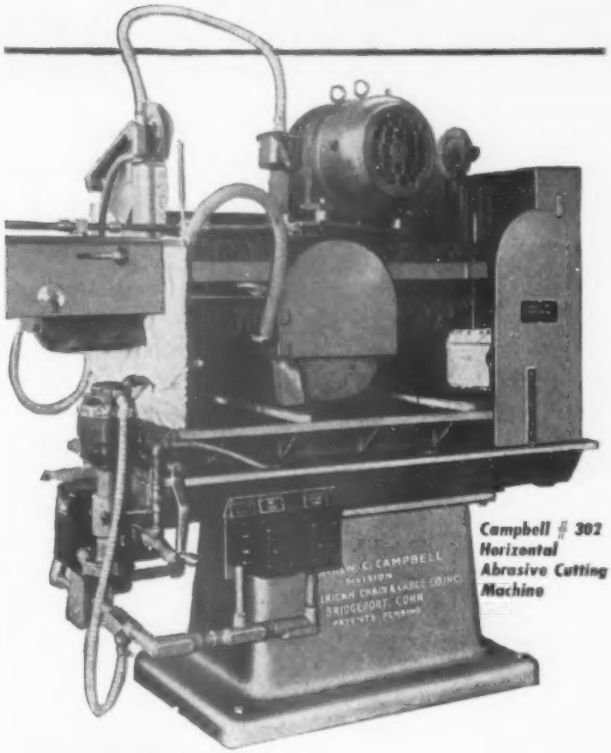

Campbell # 302 Horizontal Abrasive Cutting Machine

CAMPBELL ABRASIVE CUTTING MACHINES HELP MEET LABOR SHORTAGE

• If you cut any of the annealed or unannealed steels, nonferrous alloys, plastics, glass or ceramics—solid bar, tubular or flat stock—a CAMPBELL ABRASIVE CUTTING MACHINE will help you. • Tell the CAMPBELL Engineering Department materials, shapes, sizes, lengths before cutting, lengths of cut off pieces and hourly production required. They'll give you cost data and production procedure without obligation. ***Ask*** for a copy of the CAMPBELL ABRASIVE CUTTING CHART. It shows how the CAMPBELL complete line of Abrasive Cutting Machines can be used to open the way to new highs of production and new lows of cutting costs.

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION

BRIDGEPORT • CONNECTICUT

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

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BRIDGEPORT • CONNECTICUT

HANDY ANDY *Says*—

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

MY recent comments, on legislation affecting engineers, has netted some "strange fruit" along with diverse bouquets. "Pop" Irwin of Rubber City, f'instance, tells me that, for once, I'm downright silly. And, as table mates at Springfield, I had impressed him as a sensible guy a/c having grabbed the first tool at hand instead of fussing with the fancy cutlery.

With that preamble, he proposes that we settle the question by calling ourselves a society of technicians instead of engineers, and so on and on thru 'steen pages of script.

▼ ▼ ▼

As for eating, I've been around, and have learned a few tricks not mentioned by Emily Post. At that, I hold that the Europeans are more efficient; they cut with the right hand and stow with the left, thereby reducing lost motion. And it takes poise to roll a row of peas along a knife.

As for calling ourselves technicians, what sort, Pop?—X-Ray, dental or medical lab? First thing you know we'll be getting in Dutch with Doc Fishbein's A. M. A. No, I think we'll stay put, having somehow struggled thru the "first hundred years". Anyway, thanks for the letter, my only regret being that rationing of paper prohibits its publication.

▼ ▼ ▼

Outside of that one facetious comment, the responses— and they're plenty—indicate that the Society as a whole has been roused to action. It is now up to the various Chapter and regional officers to acquaint themselves with pending or proposed legislation bearing on engineering, and to shape it favorably to our body.

However, we must proceed without prejudice, merely contesting legislation which, in turn, may be prejudicial or discriminatory. It is my personal belief, however, that while frankly restrictive, the intent behind such legislation is to protect the public as well as the individual against unethical practice. And we are in accord with that.

In this connection, I have carefully conned the Michigan law, and can only declare it fair and equitable. There is no discrimination between the college man and the practically trained; it merely specifies that, to practice publicly, an engineer must be qualified thru examination and registration.

Should other states pattern themselves after the Michigan model, there is little for the qualified man to worry about; our job is to watch out that someone doesn't slip in a joker. And that's that. If bringing a matter that might jeopardize our right to a name is silly .... but then, there seems to be considerable difference of opinion on that score. Anyway, time will tell.

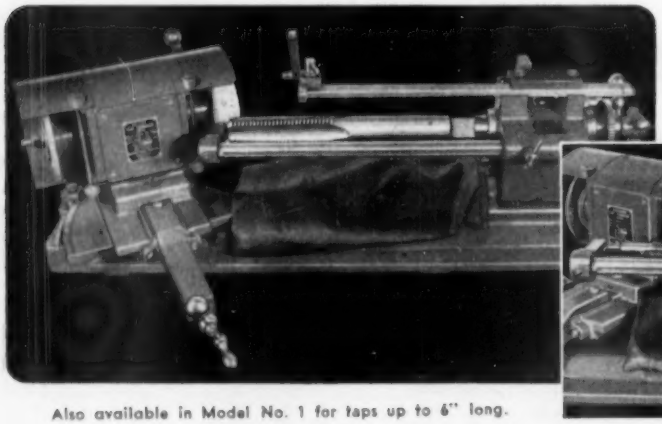
Of late, various unrelated and, for that matter, somewhat chaotic, thoughts and impressions have crystallized into a concrete conclusion. That is, that if a man lives according to his convictions, and with respect for the rights of others—if he is honest with himself and with his fellows—vindication will come even though, at first, he may have been grossly misunderstood.

▼ ▼ ▼

I am thinking, particularly, of Charles Lindbergh who, overnight, became America's number one hero. He typified the modern Viking, riding on silver wings the perilous courses followed by his forebears centuries before. And, in the first fanfare of publicity, he was dubbed everything from an intrepid youth to a "flying fool". Only a few stopped to consider the scientific genius that, combined with a gruelling training and cold calculation, made the flight possible.

But Lindbergh shunned publicity, instead, quietly devoted himself to furthering the science of aviation. And,

(Concluded on page 196)



Also available in Model No. 1 for taps up to 6" long.

KEEP LONG TAPS SHARP ON THE NO. 2 BLAKE TAP GRINDER

THE No. 2 Blake Tap Grinder is designed especially for long taps, or those with long pilots, that are difficult to sharpen by any other means. The No. 2 is used profitably even with inexperienced help — and sharpens to original accuracy all taps with 2, 3, 4, 5, 6, 8 or 10 flutes, up to 14 inches long.

The illustrations show a long tap and a tap with a long pilot being sharpened. Taps with shanks 1/2" in diameter and smaller, in any length, can be ground on either the No. 1 or No. 2 Blake Tap Grinder. Both models are fully described in Bulletin No. 5 — mail the coupon for your free copy!

EDWARD BLAKE COMPANY

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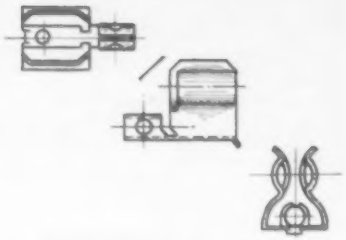
BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

PLEASE SEND ME BULLETIN NO. 5
T.E.

Name..... Title.....
Company.....
Street.....
City..... State.....

FORMED METAL STAMPINGS PRODUCED COMPLETE IN THE U. S. MULTI-SLIDE, ELIMINATING SECONDARY OPERATIONS



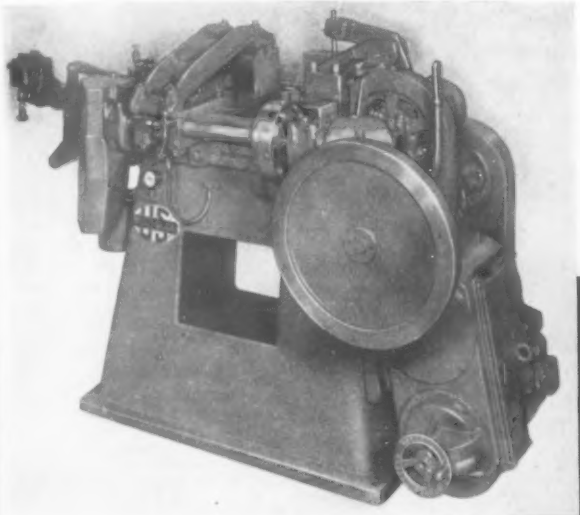
THE electrical part shown in ACTUAL SIZE above is produced from coil stock — complete, without further handling — at a speed of 140 per minute on the No. 28 U. S. Multi-Slide Machine. Another example of the advantages of the Multi-Slide Machine for the precision fabrication of many types of metal parts calling for piercing, blanking, forming, swaging and embossing operations!

The part illustrated is made of phosphor bronze .025" thick. Sequence of operations is illustrated by the diagram at bottom of page (see listing of operations immediately above diagram). Note how stock is fed into machine (left), followed by piercing, trimming and shearing operations. Then preforming, and finally cut-off.

The photograph at the left shows a No. 28 Multi-Slide Machine similar to the one used for this work. Multi-Slide Machines are made in four standard sizes to accommodate stock of various widths, thicknesses and feed lengths. Capacities for each size are detailed in adjoining table.

These machines save manpower, too—a single operator can attend to a battery of Multi-Slides, since operation is entirely automatic. Operator merely loads coils of material onto stock reel for feeding into machine.

Perhaps some of the formed metal parts produced in YOUR plant could be handled to greater advantage on the U. S. Multi-Slide. Bulletin T15 contains complete details, and your inquiries are invited.



SEQUENCE OF OPERATIONS

INDICATED IN DRAWINGS ABOVE AND BELOW
1st Station—Pierce 3 holes; 2nd Station—Trim top and bottom; 3rd Station—Shear and bend on top, shear on bottom; 4th Station—Preform; 5th Station—Cut Off; 6th Station—Finish Form.

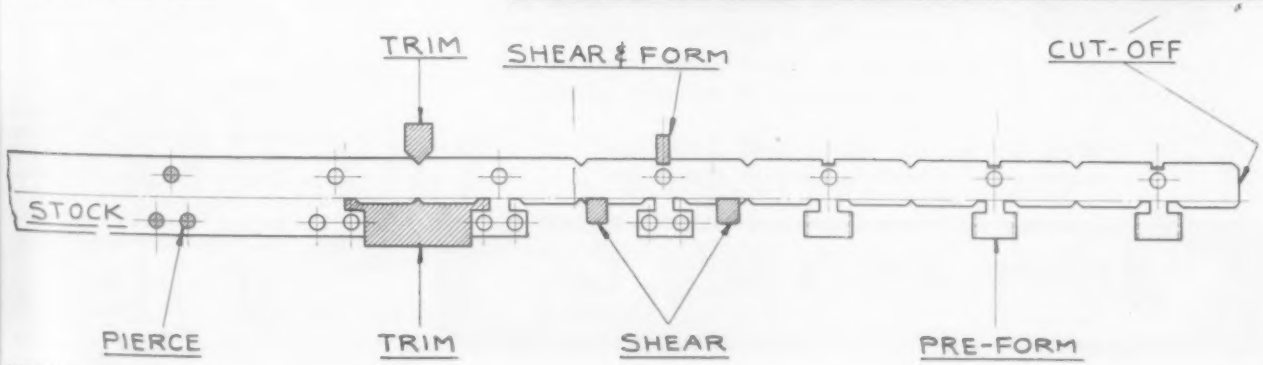
U. S. TOOL COMPANY, INC.

Ampere (East Orange), New Jersey

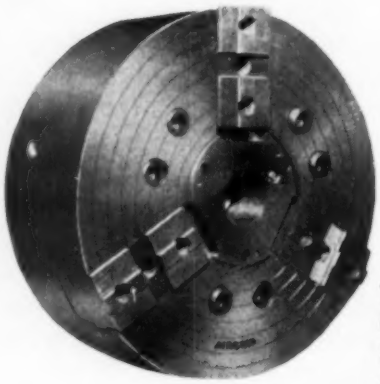
Builders of U. S. Multi-Slides, U. S. Multi-Millers, U. S. Automatic Press Room Equipment and U. S. Die Sets and Accessories.

SIZES AND SPECIFICATIONS U. S. MULTI-SLIDES

Size Machine	No. 22	No. 25	No. 28	No. 33
Length of Feed	4"	8"	8"	15½"
Maximum Width of Stock	1"	1½"	1½"	2½"
Overall Size	45x57x46	46x40x57	46x40x66	48x48x102
Net Weight	1200 lb.	1900 lb.	2200 lb	5800 lb.
Boxed Weight	1520	2200	2600	6200
Motor Recommended	1½ HP	2 HP	2 HP	5 HP



Two-Fisted "Gripping Power"

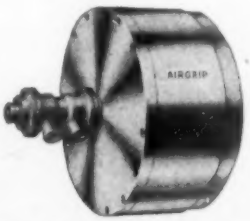


"Airgrip" Chucks

The two-fisted action of "Airgrip" Chucks is due to their double acting, self-locking feature. The cam's wedge action on the bottom of the levers operates in ***both*** directions, which more than doubles the gripping power. Also, it locks the jaws mechanically when gripping either externally or internally, so that work is held tight even if the air supply is cut off completely.

This two-fisted performance permits heavier cuts and coarser feeds to the very limit of the machine's power and cutting tool endurance. "Airgrip" Chucks, while slashing maintenance costs and reducing set-up time, will increase output records by 25%.

"Airgrip" Revolving Air Cylinders



"Airgrip" double ball bearing Revolving Air Cylinders permit speeds formerly impossible. No manual adjustments are required. This cylinder will run for years with no care or attention, as wear is automatically taken up by air pressure within the cylinder.

Hi-Po Supercharged Hydraulic Pressure Pumps

Pump develops 3000 lb. Pressure. Driven by a ½ h.p. motor! ***Two-fisted Pressure Production:*** consists of a low-pressure section which supercharges a high-pressure section. Builds up pressure fast, with minimum pulsation.

Write for bulletin, and consult Anker-Holth Engineers on pneumatic or hydraulic applications.

Anker-Holth Mfg. Co.

2733 Connors Street — Port Huron, Michigan

(Concluded from page 194)

because of a defensive veneer of aloofness, the press of the land gradually soured and, in turn, began to shape an adverse public opinion.

Then came his tour of the Continent, when he startled the western world with his statement regarding Germany's air supremacy and, incidentally, his exposé of Russia's air weakness. Crash!—the pedestal crumbled under his feet. Persona non grata in England, he returned to the States, where he espoused American isolation from European intrigue. He wanted to keep us out of war—and who didn't!—but, he also wanted America to be prepared.

▲ ▲ ▲

Things happened fast after that. The dubitable America First Committee used him as a figurehead for a negative propaganda, and, after his unfortunate speech at Des Moines, the wolf pack tore at his reputation, did everything but destroy the man. That, it couldn't do; the fibre was too tough. But, it forced his resignation from the Army, when he was finally relegated to the limbo of the forgotten.

But no, not quite! For when Henry Ford needed an outstanding technical expert for the Willow Run plant, he picked Lindbergh. Ford, too, has courage, is true to himself. And, slowly but surely, the Lone Eagle rose above his traducers, made valuable contributions toward the safety of American flyers. And now, the very press that had maligned him makes belated restitution by proposing, editorially, the restoration of his commission.

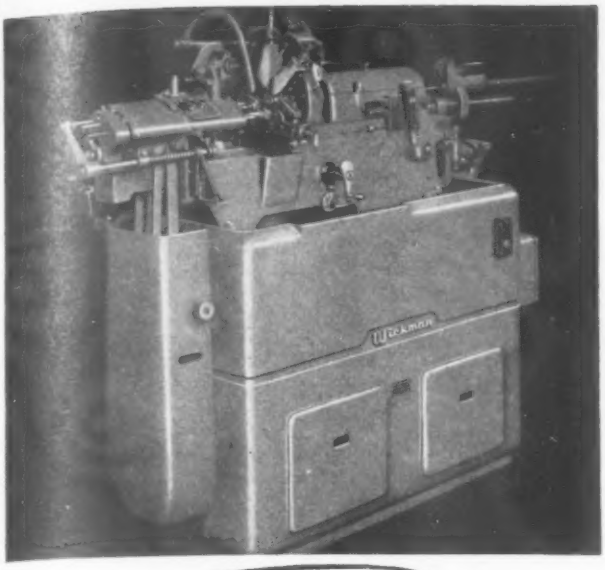
I take a certain pride in that, in this column, I took occasion to defend Lindbergh. Not that I believed that we could have kept out of the war—to me, American intervention was inevitable and only precipitated by Pearl Harbor—but I had faith in the man's analysis of Europe's air powers. And certainly, later events have vindicated that faith, even as they have vindicated my faith in America's integrity.

▲ ▲ ▲

One can only wonder, at this time, what the results might have been had the democracies heeded a warning that, to all practical purposes, may now be termed a prophecy fulfilled. For certainly, at the outset, Germany had air supremacy among other vital advantages, while Russia's vaunted air force was but a promise for later fulfillment and then only with the aid of American lend-lease.

As for the Des Moines speech, I am not yet satisfied that Lindbergh traduced the Jews. Rather, he protested their persecution, even as his racial kin overseas have given them asylum and vehemently protested persecution of all minority groups. In the published accounts, qualifying comments were deleted and those excerpts stressed tended to further besmirch a man who whatever his mistakes—as stepping from the field of science to the noisome sty of politics—was nevertheless honest with himself. That too, I believe will come out in time.

THE END

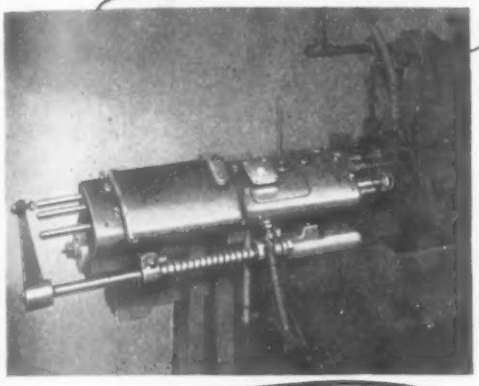


INCREASE VERSATILITY of the

Wickman

No. 2 Swiss Type Automatic With These Attachments

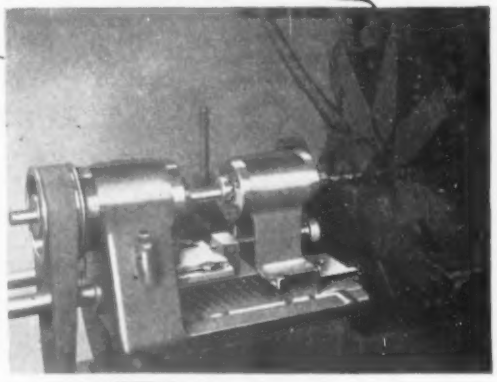
THREE SPINDLE



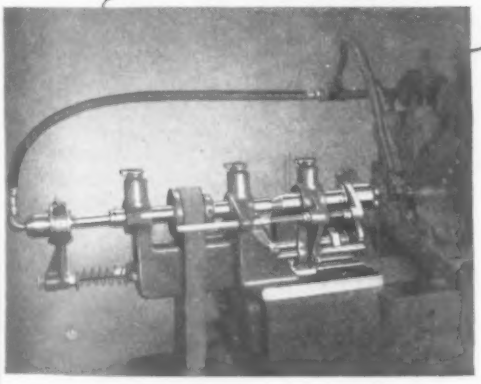
The Three Spindle Attachment provides a means for centering, drilling, reaming, threading and tapping parts produced on the Wickman No. 2 Automatic. The third spindle, which is used for threading, overruns the machine spindle to provide smooth operation without slowing the machine spindle.

The High Speed Drilling Attachment provides for drilling and reaming operations. The spindle revolves in the opposite direction from the machine spindle to provide high surface speeds with small drills.

DRILLING



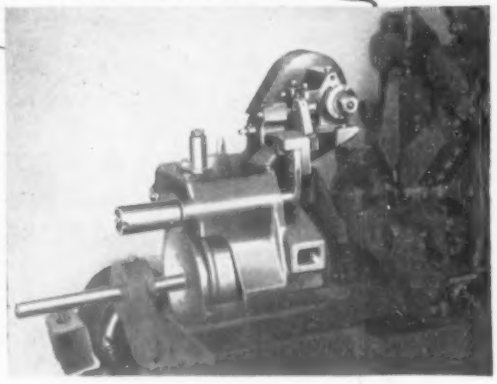
THREADING



The Revolving Die Head Threading Attachment is used to chase threads on parts being produced in the Wickman No. 2 Automatic. The Die Head overruns the machine spindle so that precision threading can be done without slowing down the machine spindle.

This attachment picks the part up as it is being cut off and carries it to a slotting saw. This attachment is independent of the machine and may be used in conjunction with any other attachment.

SLOTTING



Although a taper can be generated by a combination of tool and headstock movements, where extreme accuracy is required a taper turning attachment can be supplied. This attachment transfers the taper directly from an accurately ground form-bar to the No. 1 tool.

All Wickman attachments are easily interchangeable and will fit any Wickman No. 2 Swiss Type Automatic.

WICKMAN HIGH PRECISION AUTOMATIC

THE Wickman CORPORATION

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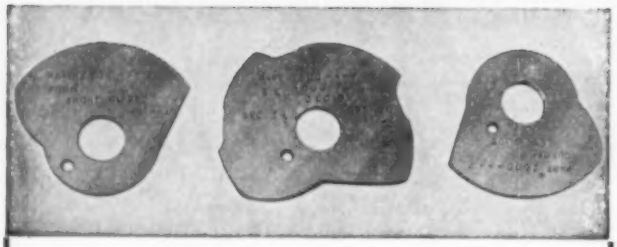
DETROIT 3, MICHIGAN



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Universally accepted by leading machine-tool designers and builders, GUSHER Pumps have many original features.

Simplicity and sturdiness of construction, with a minimum of wearing parts, assure long life and full-time, hard-usage service. Multiplicity of types and sizes, producing anything from a tiny trickle to 200 gallons per minute, gives you your choice of a Gusher model and type for your special needs.

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Model TL-7320
See Section 2 of new catalogue indexed for quick reference

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1809 READING ROAD **CINCINNATI 2, OHIO**
The "Gusher"—A Modern Pump For Modern Machine Tools

Highly recommended for fine work. Insures top most precision for gaging height and parallel, straight, square and flat surface.

The Opti-Flat when tested with optical methods checks to an accuracy of 50 millionths or better. Manufactured from Pyrex Brand glass. Opti-Flats are considered essential as an absolutely reliable starting point for scribing, layout, establishing locations, sine bar work, etc.

Opti-Flats are available in two sizes, 12" diameter by 2" thick, price $58.00 and 16" diameter by 3" thick, price $88.00.

Write today for new literature pointing out superiority of Opti-Flats.

The 5" Sine Bar shown above costs only $19.00
Order today . . . Available immediately.

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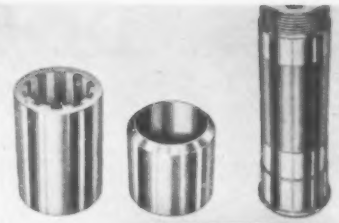
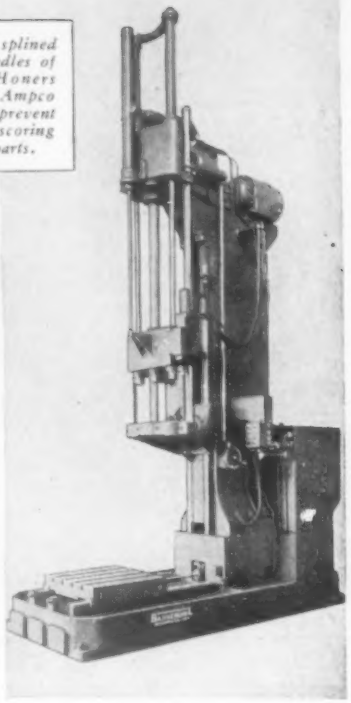
JOHNSON GAS APPLIANCE CO.
625 E. Ave. N. W., Cedar Rapids, Iowa



Bushings for splined driving spindles of Barnesdril Honers are made of Ampco Metal, to prevent galling and scoring of mating parts.

Protected against costly failures

. . with parts of wear-resisting
Ampco Metal



Like other leading makes of machine tools, Barnesdril Hydraulically Reciprocated Honing Machines are guarded against breakdowns at critical points with parts of Ampco Metal, a superior alloy of the aluminum bronze class that lasts several times as long as ordinary bronzes. Adopted by over 90 leading machine tool makers where they need exceptional strength, hardness, and resistance to wear, shock, and fatigue. Check for parts of Ampco Metal, as a mark of quality in the machines you buy. And replace worn parts of your older machines with durable Ampco. Write for File 41 of Engineering Data Sheets. M-9

Ampco Metal, Inc.
Department TE-9 Milwaukee 4, Wisconsin

AMPCO Metal
The Metal without an Equal

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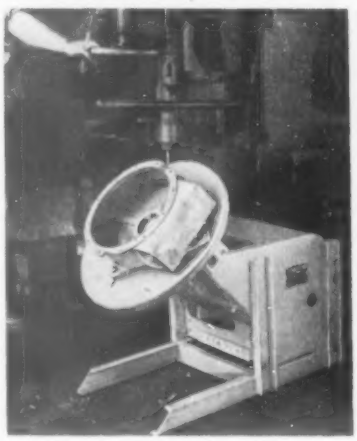

If work simplification is your problem, investigate this equipment . . . it will pay dividends

INDUSTRIAL DIVISION **Ransome** MACHINERY COMPANY
DUNELLEN, NEW JERSEY
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• For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 2567 West Grand Boulevard, Detroit 8, Michigan.

• Senior initiation fee is five dollars. Dues eight dollars per year for senior grade membership and five dollars per year for junior grade membership. Junior initiation fee is two dollars.

• **Dayton**—The Dayton Chapter held its annual "golf" meeting at the Inland Golf Club. Ora Peters and Bob Kuntz set up a nine hole miniature course.

• **Atlanta** — The Atlanta, Georgia, Chapter met September 6 at the Dixie Ballroom, Henry Grady Hotel, to hear C. M. Jenkins, general foreman of the Westinghouse Electric's metal shop at Atlanta discuss "Electronics at Work". R. E. Ferris, DoAll South Atlantic Co., was speaker at the June meeting.

• **Springfield**—F. O. Hoagland, Master Mechanic of Pratt & Whitney Machine Tool Builders, discussed "Jig Boring and Its Application" at the September 5 meeting of the Springfield, Illinois, Chapter. The meeting was held at the Leland Hotel. At the chapter's August meeting Lt. Col. H. Wirt Butler spoke on war in the Pacific. He emphasized importance of maintaining tolerances in armament. J. A. MacDonald, Chief Tool Designer, Caterpillar Tractor Company, spoke on "Behind the Scenes in Tool Engineering". A film, "Elements in Tool Designing", completed the program.

• **St. Louis**—Picnic lunches drew 300 members of the St. Louis Chapter to Lemay Grove for their seventh annual stag outing July 22.

• **Wichita**—M. M. Ross of Ross Engineering Company was host to the Wichita Chapter August 8 at the firm's plant. Feature of the evening was a talk and demonstration by James E. McCrea, developer of "Insta", a widely-known coolant. Ross provided lunch for the 60 members of the chapter to make the tour.

• **Portland (Ore.)**—Three pictures occupied the Portland Chapter at their July meeting. "Chip Breaker Grinding", "How Tools are Brazed on Shanks" and "Shell Turning with Carbide Tools" were offered by the Kennametals, Ltd. The company also showed a series of slides on carbide milling operations.

• **York**—M. F. Judkins, Chief Engineer of Firth-Sterling Steel Company, was principal speaker at the August 8 meeting of Central Pennsylvania Chapter. His topic was Firthite Tungsten Carbide and was supplemented by a colored moving picture.

• **Erie**—William L. Kennicott, Chief Engineer of Kennametal, Inc., presented Erie Chapter members with a discussion of "High Speed Milling with Cemented Carbide". The address was supplemented with a film showing actual applications in plants in the United States.

James J. Hasse

National Headquarters, American Society of Tool Engineers, announces appointment of Charles J. Hasse as Office Manager. He succeeds Howard M. Witt.

A native Detroiter, Hasse was graduated from St. Joseph's Commercial College, and has attended University of Detroit, Wayne University and University of Chicago.

* * *

• **San Diego**— Three speakers highlighted the August 11 session of San Diego Chapter. W. F. Asmus, Director of Region 18 A. S. T. E. spoke on "Engineering", Captain Rico Botta, U. S. N., told "How Tool Engineering Facilitates Repair of Aircraft", and Harry Woodhead, President, Consolidated Vultee Aircraft Corporation, spoke on "Tool Engineering of the Past, Present and Future".

• **Detroit**—Detroit Chapter set aside its dignity and on August 24 staged their annual "moonlight". Taking their ladies and friends they sailed on a lake steamer while they danced and visited.

• **Potomac**—Potomac Chapter devoted its September 7 meeting to plastics. Speaker was Lieutenant Henry A. Parkin, U. S. N. R., Engineering Officer of the Naval Ordnance Laboratory at Silver Springs, Md. He discussed "Plastics—Uses and Fabricating Methods". In his discussion he treated origin, size and future of the industry. A colored movie, "Shape of Things to Come" was presented by the Boonton Molding Company.

• The semi-annual A. S. T. E. meeting will be held in Syracuse October 12, 13 and 14. See complete details on page 134 of this issue.

• **Los Angeles**—Los Angeles Chapter met August 10 to hear H. L. Harvell, president of Harvell Manufacturing Company, on the topic "Tooling for Mass Production of Die Casting".

September Meetings

Milwaukee—September 14, Astor Hotel. Speakers will be A. J. Langhammer, President Amplex Division, Chrysler Corporation, topic: "Powdered Metallurgy of Oilite and Other Metals"; and Casanave Young, Patent Attorney.

Louisville—September 12, resumption of monthly dinner meetings.

Fond Du Lac— September meeting will be held at Fond Du Lac.

Boston—September 14, Schrafft's Restaurant. Speaker will be W. J. Copley, Lincoln Electric Company.

Buffalo-Niagara—September 21, Kleinhans Music Hall. Speaker will be William Jack, President of Jack & Heintz.

Chicago—September 11, Huyler's Restaurant. Speaker will be Clifford Ives of Ives Engineering and Planning Company. He will discuss "Engineering, Planning and Tooling for Post War Civilian Products".

Cleveland — September 8, Hollenden Hotel. Speakers will be W. M. Farrar, General Manager, Cleveland Better Business Bureau, topic "Interesting Fraud Cases"; and Fred Whitcomb and R. E. Peterson, Sales Engineer and Metallurgist, respectively, of Deepfreeze division, Motor Products Company, who will share a topic.

Northern New Jersey—September 12, Hotel Robert Treat. Speaker will be L. Lingler, Field Engineer, Sheffield Corporation.

Rochester — September 14, Lower Strong Auditorium. R. F. Koehring, Chief Metallurgist, General Motors Corporation, Moraine Products Division, will discuss "Powder Metallurgy".

Dayton—The Dayton Chapter is sponsoring an aircraft exhibit in conjunction with the Montgomery County Fair. On September 8 they will conclude their event with a dinner meeting at the Biltmore Hotel.

San Diego—September 15, San Diego Women's Club.

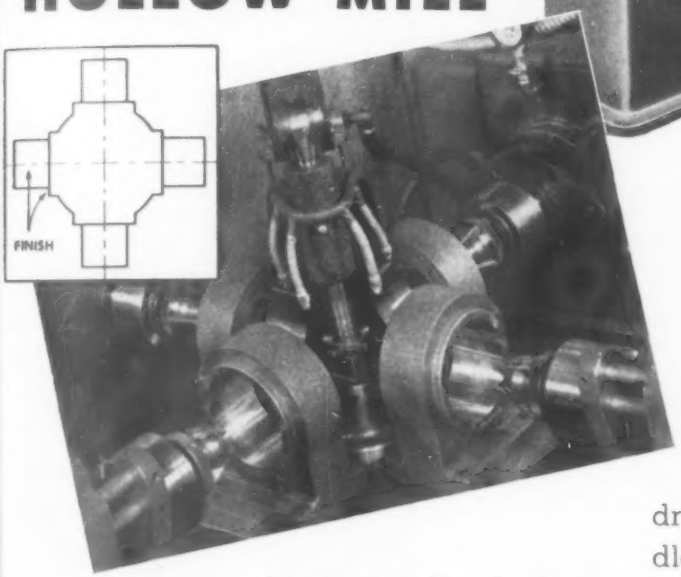
Atlanta—September 17, first chapter outdoor picnic, North Fulton Park, Atlanta.

Portland (Ore.)—September 21, regular meeting.

ANOTHER APPLICATION THAT DEMONSTRATES THE VERSATILITY OF THE LEMAIRE HYDRAULIC UNITS

Four Standard TWIN RAM UNITS

Combine to make a Highly Efficient HOLLOW MILL



Four standard end bases, each supporting a LeMaire Twin Ram Hydraulic Unit, are bolted to a center base to form a new Four-Way Universal Machine for hollow milling and facing universal joint spiders. By machining these spiders on a hollow mill production was stepped up threefold.

Automatically locked and securely held by air clamps, the piece is approached simultaneously by four spindles operating 90° apart. The outside diameters of the four trunnions are machined and their shoulders faced.

Each spindle revolves in a sleeve held stationary in a bracket, thus eliminating gaulding and possible chip trouble.

This machine can be arranged for boring, drilling, reaming, centering, etc. The spindles can be made to perform different operations all at one time, using an automatic or hand index table in the center.

Does this unusual versatility offered by the Twin Ram Units suggest applications you might make? Can you imagine how economical and practical it would be for you to have these hydraulic units in your plant to increase your scope of operations with minimum equipment? Send to LeMaire Tool and Mfg. Co. for data sheets.

LeMaire

LE MAIRE PRECISION PRODUCTS

BUILDERS OF SINGLE AND MULTIPLE SPINDLE MACHINES FOR BORING, DRILLING, REAMING, TAPPING, ETC.—TWIN RAM HYDRAULIC UNITS —MATCH-IT GEAR CHUCKS.

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Columbia TOOL STEEL

NO LIMIT—
War production has demonstrated that there is almost no limit to what can be done with "Good Tool Steel."
We invite your inquiries.
It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
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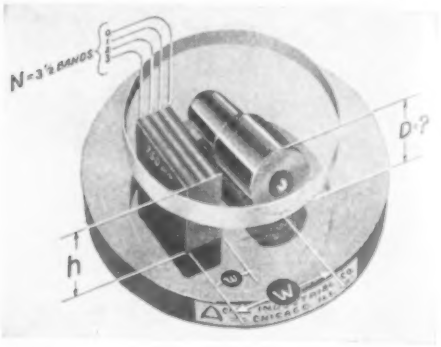
MEASURING A PLUG GAGE with LIGHT WAVES

using an optical flat, a toolmakers flat and a gage block



The formula is:

$$D = h + (.000012 \times N \times \frac{W}{w})$$

Substitute the actual values

$$D = .750 + (.000012 \times 3\tfrac{1}{2} \times \frac{1\text{-}7/16''}{23/64''})$$

and get the answer

$D = .750168$ inch.

It's just that simple!

Write for new, free Lightwave Measurement Booklet.

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Makers of Standardized Jig and Fixture Bushings

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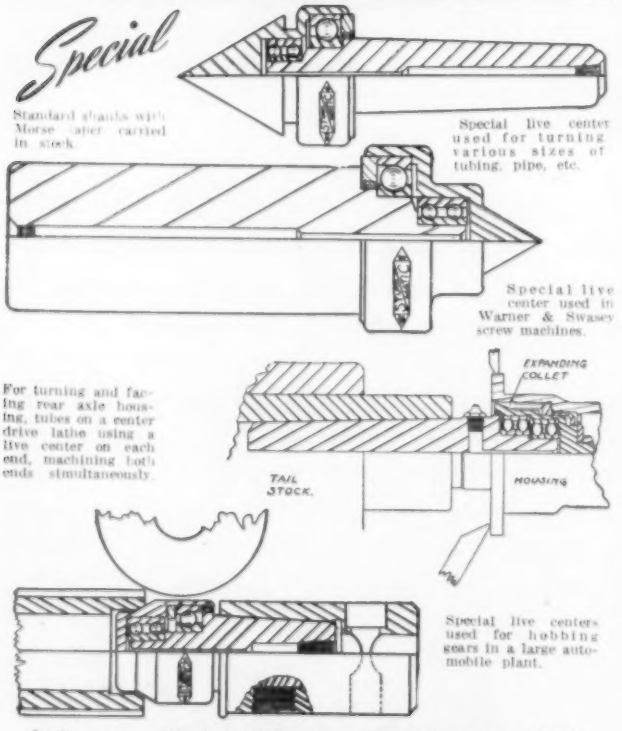
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Standard shanks with Morse taper carried in stock
Special live center used for turning various sizes of tubing, pipe, etc.
Special live center used in Warner & Swasey screw machines.
For turning and facing rear axle housing, tubes on a center drive lathe using a live center on each end, machining both ends simultaneously.
EXPANDING COLLET
TAIL STOCK
HOUSING
Special live centers used for hobbing gears in a large automobile plant.

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GRAND Speed CLAMPS

GRAND QUICK LOCKCET With Trigger Release

The best time-saving clamp for light, fast production work. Can be applied or released in a jiffy. Will pay for itself in a few days. Swinging, locking lever, gib seat makes it absolutely non-creeping on any parallel, slanting or rounded surface. Spring tension holds to desired opening. Trigger release action frees screw instantly with a single motion for re-setting or permits re-clamping to other work of same thickness without any further screw adjustment. Screw, swivel and trigger release action are COPPER PLATED. Made of heat-treated spring steel. Proof test approx. 2500 lbs.

Two models, one for Aluminum and Soft Metals

Ask about our Complete Line of GRAND Speed Clamps for every kind of work.

Catalog Free on Request.

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MIDWEST COUNTERBORE SETS

—FOR COUNTERBORING AND SPOT FACING OPERATIONS THAT SAVE THE TIME AND COST OF EXTRA SET-UPS, OTHER SLOWER MACHINING AND COMPLICATED ASSEMBLIES

Set No. 1 Contains The Following Items:

One #5MB Group Holder
One #7MB Group Holder

COUNTERBORES

9/16" Dia.	7/8" Dia.
5/8" "	15/16" "
11/16" "	1" "
3/4" "	1 1/16" "
13/16" "	1 1/8" "

COUNTERSINKS

7/8" Dia.	60 Deg.
7/8" "	82 "

PILOTS

5/16" Dia.,	1/4" Shank
3/8" "	1/4" "
7/16" "	1/4" "
1/2" "	1/4" "

PILOTS

9/16" Dia.,	1/4" Shank
5/8" "	1/4" "
11/16" "	1/4" "
3/8" Dia.,	5/16" Shank
7/16" "	5/16" "
1/2" "	5/16" "
9/16" "	5/16" "
5/8" "	5/16" "
11/16" "	5/16" "
3/4" "	5/16" "
13/16" "	5/16" "
7/8" "	5/16" "
15/16" "	5/16" "
1" "	5/16" "

Midwest Counterbore Sets include only standard tools; replacements can be made promptly from our stock. The cutters can be reground quickly and easily; and reground many times before replacement is necessary.

Each set is furnished with a corresponding range of alloy steel, hardened and ground pilots. Pilots are chamfered at front end and they are designed for quick interchanging or removing in case of breakage. Each set is furnished with Group Holders fitted with *Midwest Taper and Pin Drive.* There is perfect alignment between the holder and cutter—highly important in an assembled tool. Each holder handles a wide variety of cutter sizes. Cutters can be interchanged in a jiffy.

You can depend upon Midwest Precision Quality and Manufacture to provide faster cutting operations, sustained accuracy and economical performance.

Midwest also makes special combination counterbores, step counterbores for two or more diameters, holders with stop collars and other production-type combinations.

Cutaway View Showing Features of Midwest Counterbore Assembly.

Midwest offers a complete designing and engineering service. Send us an outline of any metal cutting problems you may have and let us send you suggestions on the way to solve them with a minimum of tools and operations.

Consult the Midwest Representative located nearest to you. He is thoroughly experienced and can ably assist you.

Midwest Precision Metal Cutting Tools are also handled by many leading Industrial Distributors.

MIDWEST TOOL & MFG. CO.

MILLING CUTTERS • SLEEVES • COUNTERBORES • END MILLS • REAMERS • SPECIAL TOOLS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

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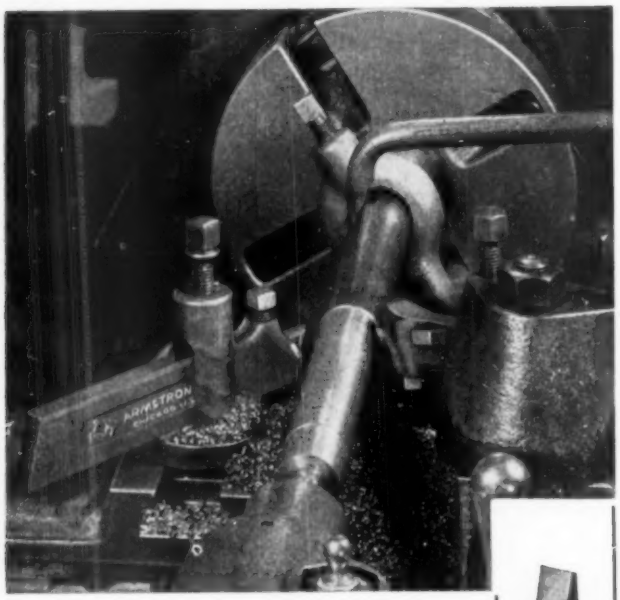
ARMSTRONG

Carbide TOOL HOLDERS



Standard Shape Armide Cutters

Armide (Carbide Tipped) Cutters and ARMSTRONG **Carbide** TOOL HOLDERS can increase your output on long-runs and tough or hard steels. They increase the interval between tool re-grindings from 20 to 50 times. They cut the toughest and hardest steels easily.

Armide Cutters come in 5 standard cutting shapes—"A" Right-hand Turning, "B" Left-hand Turning, "C" Square Nose, "D" Round Nose (for general turning and facing), and "E" 60° Threading. 10 sizes.

ARMSTRONG **Carbide** TOOL HOLDERS, come with "Straight", "R. H. Off-set" or "L.H. Off-set" Shanks. They hold cutters at 180° (proper for carbide) provide extended, close-up support to the cutting edge, and are extremely rigid.

"A"

"B"

"C"

"D"

"E"

Write for "Carbide" Circular.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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DIAMOND TOOLS and TUNGSTEN CARBIDE TOOLS

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SOLE MAKERS OF WILLEY'S METAL

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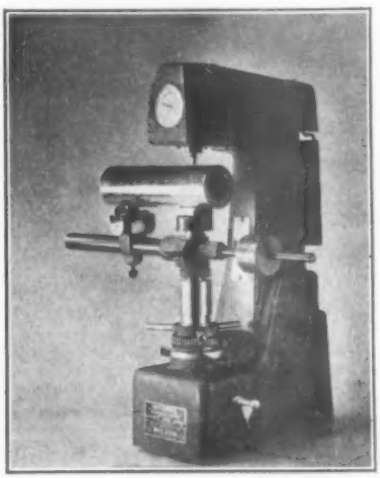
"ROCKWELL" HARDNESS TESTER



Shipment within a few days of these enormously improved new models

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MECHANICAL INSTRUMENT CO., INC.

"An Associate Company of American Chain & Cable Company, Inc."

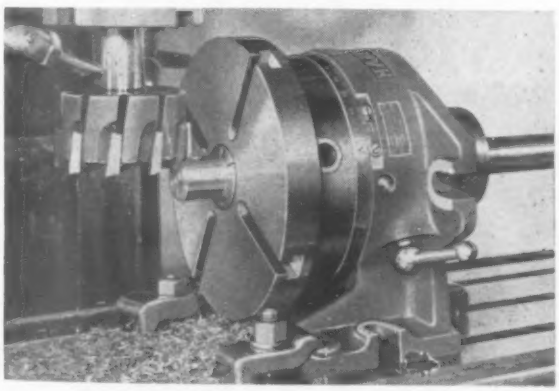
FOR ANY MAKE OF LATHE OR GRINDER.

See whether the Zagar Speed Chuck is not the very best fixture of its kind: patented cam lock; collet can be opened and closed while machine is running; collet runs dead true on any spindle; length dimensions are no problem, since collet does not move horizontally in opening and closing; takes any average variation in stock diameters; easy to mount—no holes to drill in machine; no heating at any speed; no slippage; greater-than-maximum spindle capacity; precision built throughout. Increases production ***with accuracy.*** Ask for demonstration. Bulletin 700-E.

ZAGAR TOOL, INC. 23881 Lakeland Blvd. CLEVELAND 17, OHIO

Zagar INDEXING AND HOLDING FIXTURES

HARTFORD SUPER-SPACER FOR MILLING JOBS

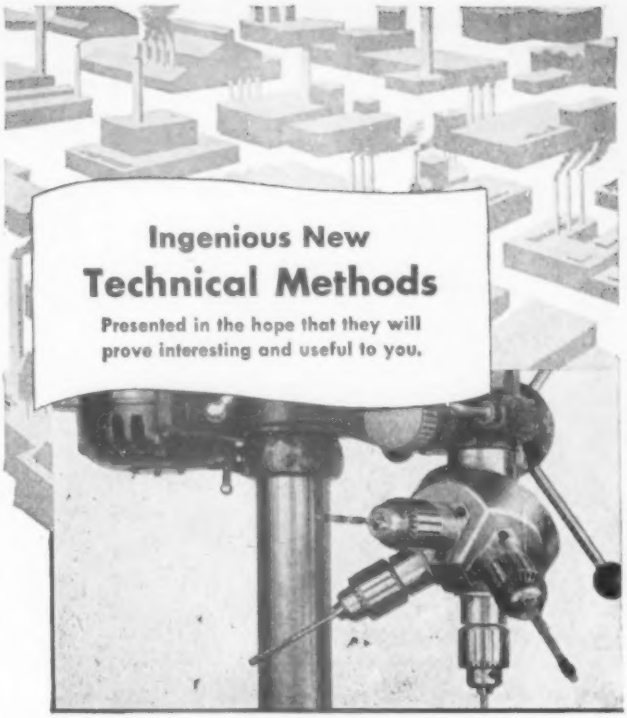


● The Hartford Super-Spacer can simplify many puzzling machining operations in your tool room. The Super-Spacer is easily set up for a wide variety of milling operations, and is capable of handling numerous other jobs when equipped with a face-plate and draw-in collet combination.

● Shown is an efficient combination for milling bar stock on a vertical miller. As a basis for special fixtures, Hartford's Super-Spacer provides substantial, accurate indexing.

WRITE FOR COMPLETE INFORMATION

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.



Amazing New Four Spindle Turret Attachment for Drill Press!

Now one drill press can do the work of four and, at the same time, effect a savings of up to 75% in floor space, with the "Quadrill" attachment. This rotary device will accommodate four boring or cutting tools at the same time, yet one tool *only* is in motion when the head is in operating position.

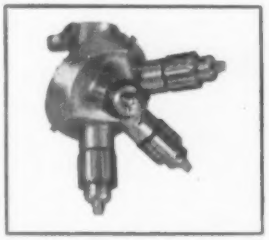
The entire unit is assembled to the quill of the drill press and is driven from the drill press spindle. Accuracy and rigidity of alignment of the "Quadrill" are assured by the special construction of the driver and spindles, thus efficiency is only limited by the accuracy and power of the drill press itself.

Foolproofing in indexing is accomplished by visual markings and by the relationship of the index pointers on the index disc, as well as the extension of the spring retainer. Four hardened and ground spindles are fitted for No. 32 Jacobs chucks or their equivalent. To provide correct positioning at all times, the entire spindle assembly is located by means of an accurate fitting of recess and undercut, between turret and bearing housings. The hardened friction starter and driver have been so constructed that at any speed proper synchronization of the driver teeth is accomplished without clashing.

It goes without saying that our fighting men must have the finest possible quality materials home industry can produce. So, although the stock of quality raw materials from which Wrigley's Spearmint chewing gum is made is growing steadily smaller, they are still maintaining pre-war standards. However, they can now make only a portion of their former output, so all of this limited production is going to our fighting men and women overseas only . . . where it is an "on-duty" need.

You can get complete information from Chicago Drillet Corporation, 919 North Michigan Avenue, Chicago 11, Illinois.

Quick and positive indexing assured by pointers on index disc

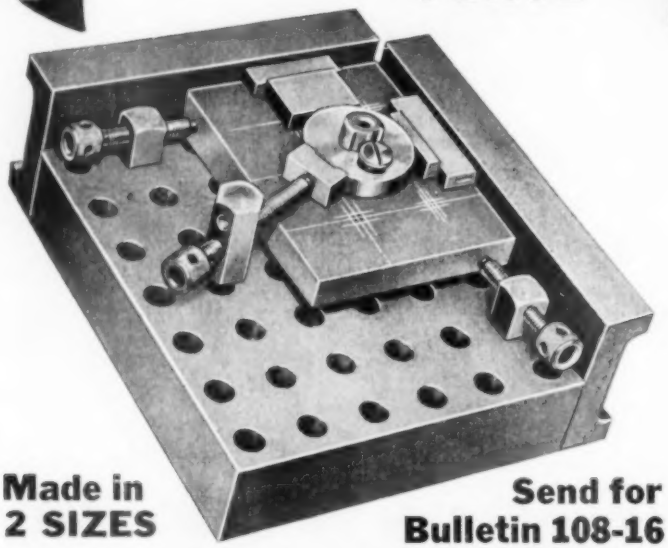


Quadrill assembly complete ready for attachment to drill press

Y-141

Eliminate COSTLY MACHINE TOOL Equipment

WITH THIS ANGLE PLATE "HOLOCATOR"



Made in 2 SIZES

Send for Bulletin 108-16

For accurate locating of all drilled and reamed holes and the laying out of dies and drill jigs, you can perform this task on any drill press very quickly with this tool-makers' device.

This precision device will take care of about 75% of the work that has to be performed on the average Jig Boring Machine.

This "Holocator" can also be used to advantage as a universal precision drilling and reaming jig, where accurate duplicated parts are required in small lots and where ordinarily a special jig would be required.

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TAPS

for HIGH PRODUCTION

Lower Cost Per Threaded Hole

These high production taps produce consistently more accurately threaded pieces to lower the cost of your tapping operations.

Precision ground from the hardened solid of high speed steel, HY-PRO tap tolerances are held to extremely close limits. *Accurate tapping assures tighter, stronger fastenings that defy vibration!* Specify HY-PRO for High Production.

Send for HY-PRO catalog on company letterhead

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A.
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New! Hammond WET TOOL GRINDERS

FOR CARBIDE AND HIGH SPEED, TOO

LOOK! *Hammond's* NEW 10" and 14"

Provide many improvements over previous models: cup wheel safety discs—free flowing, fully adjustable coolant spouts—and splash pans. Under all conditions No spray-No splash grinding is assured. "You're dry when you grind wet!"

WRITE FOR BULLETIN 204

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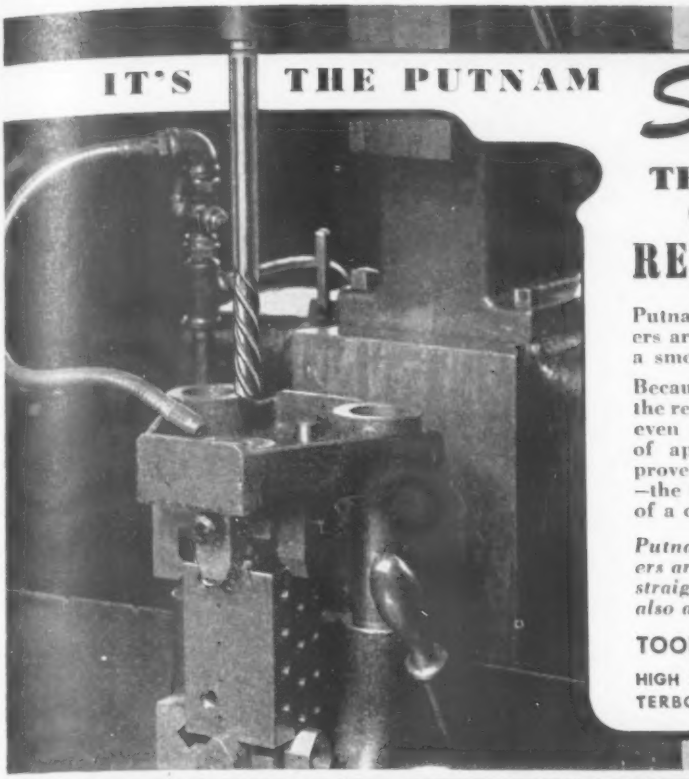
1636 DOUGLAS AVENUE

Eastern Branch: 71 W. 23rd St., New York, 10, N. Y.



IT'S THE PUTNAM

Spiral

THAT PREVENTS CHIP CLOGGING DURING REAMING OPERATIONS

Putnam Hi-Speed Spiral Fluted Chucking Reamers are fast-cutting tools that never fail to leave a smooth, accurate hole.

Because of the spiral, chips are forced ahead of the reamer and do not jam and scratch the finish even when reaming the deepest holes. Typical of applications where these Putnam reamers prove highly effective is the operation illustrated —the reaming of a hole through the full length of a centralized lubricating device.

Putnam Hi-Speed Spiral Fluted Chucking Reamers are stocked in a wide range of sizes and with straight or taper shanks. Special diameters are also available . . . all can be delivered promptly.

TOOLS THAT CUT FASTER • LAST LONGER

HIGH SPEED END MILLS • CONTINUOUS PILOT COUNTERBORES • SPIRAL FLUTED CHUCKING REAMERS

ARMY E NAVY

PUTNAM TOOL COMPANY

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Now **-THREE WEEKS DELIVERY *of* MAGNA-SINES**

FOR FAST, ACCURATE GRINDING SET-UPS

The constant demand for Magna-Sines has brought about production operations in the Robbins plant that now make possible a much greater and steadier volume than in months past. As a result, much faster deliveries can be promised—with practically all models being shipped within three weeks after the order is received. Now you have the opportunity to take immediate advantage of the many time-saving, money-saving features of the Magna-Sine for your angular grinding work.

of

ROBBINS SINE PLATES

FOR ANGULAR INSPECTION AND JIG BORING

The same prompt deliveries apply to these non-magnetic Sine Plates produced by Robbins. Not only are these models being used extensively for angular inspection work, but many plants have found them invaluable for jig boring. Like the Magna-Sine, they are available in two sizes in both single and compound angle types. For full information, see your Robbins representative or write directly to the factory.

ROBBINS ENGINEERING COMPANY

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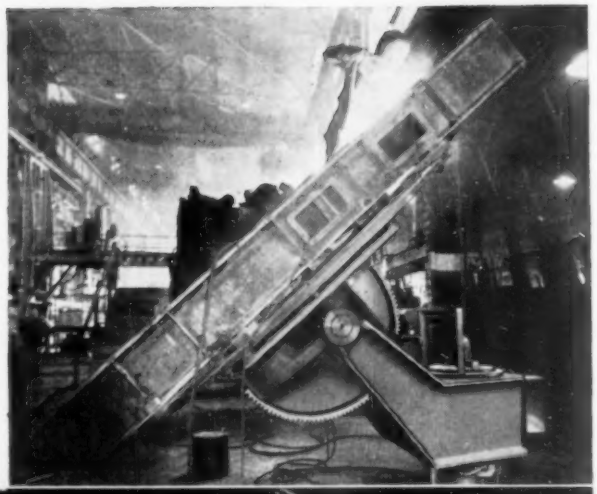
Handle the
BIG JOBS
Easily
AND
Safely



C-F POSITIONERS

With C-F Positioners each welder can position even the most cumbersome weldments with a push button control—without crane work or handling crews. He can rotate the weldment a full 360°, rotate it at any speed from 0 R.P.M. up and can tilt it to 135° beyond horizontal . . . can weld all sides, surfaces and angles down-hand with a single set-up; with larger rods and fewer passes. All C-F Positioners, both stationary and portable, are pedestal mounted to give maximum floor and working clearance; all are adjustable for height.

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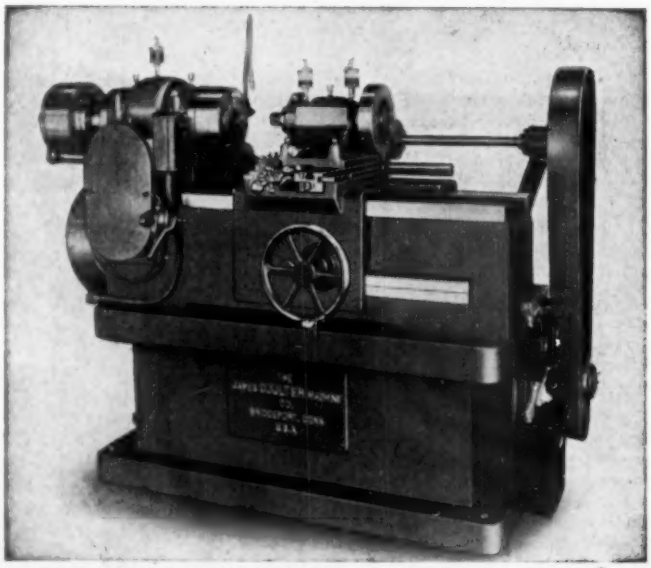
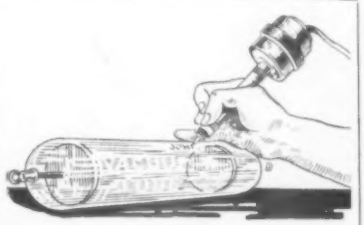
PRECISION THREAD MILLER
FULL AUTOMATIC CONTROL



INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James **COULTER** *Machine Co.*
BRIDGEPORT • CONNECTICUT • U. S. A.



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and Save it!
with the
TORNADO
Electric Writing Tool

PROVIDES an easy, economical, modern way to mark such materials as metal tags, glass, porcelain, plastics, etc. With proper identification you save valuable and often hard-to-replace tools or articles.

Not much larger than a pencil, the TORNADO Writing Tool operates on the same basic principle of point contacting the object. Easy to use on any of the many part-marking jobs often required to be quickly and neatly done.

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PRODUCTION TOOLS

ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

This precision gage serves ALL THREE purposes!

Measures precision bores to fractions of .0001".

COMTORPLUG

By using Comtorplugs, you are able to set up a "matched gaging" procedure whereby machine operators have adequate gaging equipment to maintain close tolerances, and the same precise gage is used by the inspectors. Numerous airplane, automotive and other high-precision plants are now set up on this basis, and will carry its advantages over to their peace-time operations. Comtorplug equipment is readily available.

Request Bulletin 29

THE COMTOR CO.
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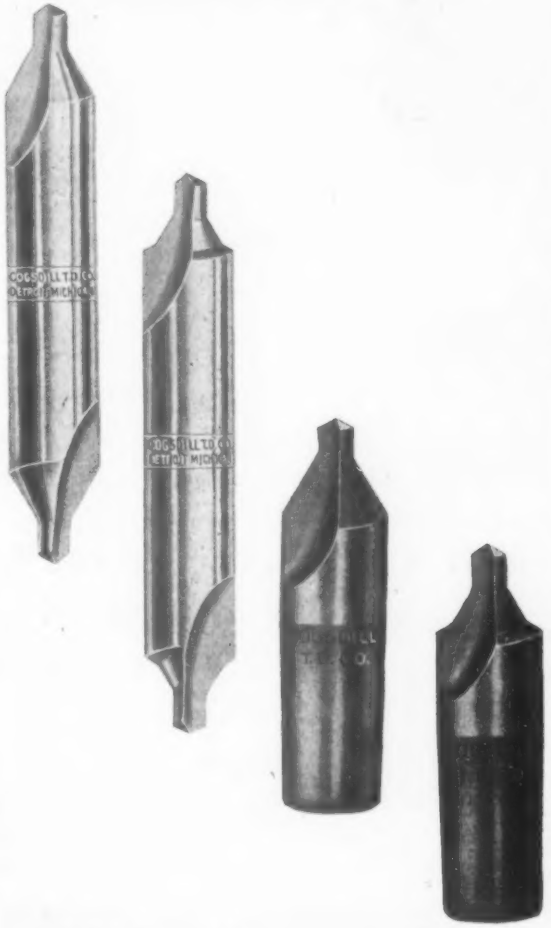
"RADIALLY GROUND"

COMBINATION DRILL AND COUNTERSINK



COGSDILL high speed steel combination center drills have the inherent stamina to stand up under the toughest jobs.

•

Available in thirteen sizes and six styles; double end, taper shank, and stub taper.

COGSDILL TWIST DRILL COMPANY

BOX 97, COLLEGE PARK STA.
DETROIT 21, MICHIGAN

Automatic SPINDLE ALIGNMENT

Accurate tapping and reaming become very simple if you use a Ziegler Floating Holder, because it assures automatic spindle alignment even when the set-up is off as much as 1/32".

The result is the elimination of over-size and bell-mouthed holes—which means fewer rejects and, consequently, lower production costs.

Remember this whenever you find your spoilage losses are becoming excessively large. You can quickly solve the problem by installing Ziegler Holders on all of your machines.

W. M. ZIEGLER TOOL CO.
1920 Twelfth Street — Detroit 16, Mich.

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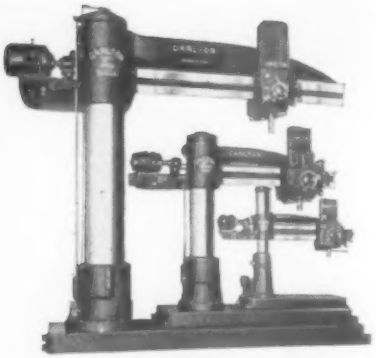
Ziegler ROLLER DRIVE **FLOATING HOLDER** for Taps and Reamers...



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL FEATURES—

1—LOW HUNG DRIVE TO THE SPINDLE
2—ALL POWER DRIVEN PARTS RUNNING IN OIL
3—QUIET RUNNING AT ALL SPEEDS
4—CONCENTRATED AND CONVENIENT CONTROLS
5—CONSTRUCTED ON UNIT PRINCIPLE

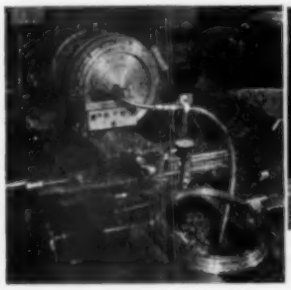
THE CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U.S.A.

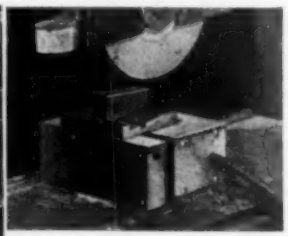
NEW AND REVOLUTIONARY MAGNETIC CHUCKS for TOOL ROOM & PRODUCTION

POWER-GRIP

Detroit, Mich. "We are pleased to say this has meant a 300% increase in production and a 5% reduction in scrap to this item." — Square Tool, Die & Mfg. Co.

Providence, R. I. "We take this opportunity to tell you that this is one of the finest and most useful tools in our plant." —Lawrence H. Cook, Inc.





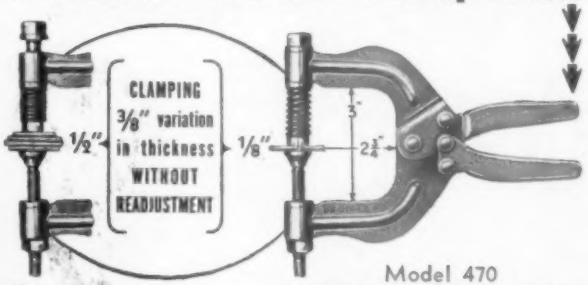
Above: IN STOCK to 36 inch.
Left: SPECIAL — QUICK.

• These are only two of the many applications of our new Magnetic products. Our illustrated catalog, mailed upon request, shows others. We may have a dealer near you, to help with practical suggestions to save you money and time.

• Our products operate from special efficient, enclosed control units that plug into 110 Volt A.C. lighting circuits. Magnetizing voltage is only 6 Volts D.C. — safe, no shock, no heat, long lived.

ROCKFORD MAGNETIC PRODUCTS CO.
1015 Sixth Ave. — Rockford, Ill.

Now You Can Clamp Dimensional Variations Without Readjustment



Model 470
DE-STA-CO *Portable* **CLAMP**
With Pressure-Matic Feature

"Pressure-Matic" . . . a De-Sta-Co feature, provides up to 3/8" automatic adjustment of clamping thickness. Thumb screw and lock nut gap adjustment. Used in riveting, drilling, welding, gluing, sawing, routing and assembly operations. Swivel foot provides angular clamping. Spindles copper-plated against welding spatter. Quicker, easier than "C" clamps. Smaller sizes available.

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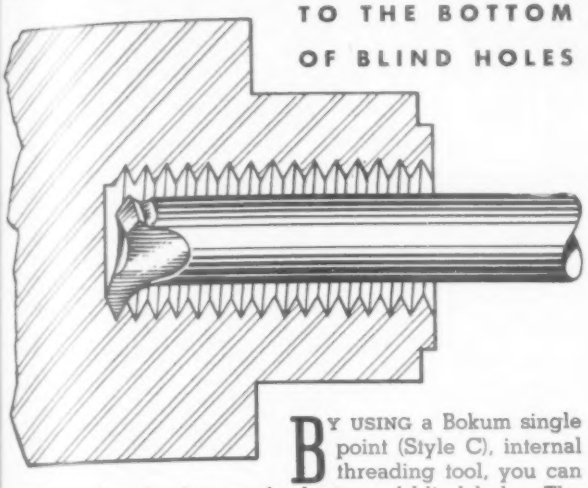
DETROIT STAMPING CO.
Established Over 25 Years
356 Midland Ave • Detroit 3, Mich.

How To Make *PERFECT THREADS* TO THE BOTTOM OF BLIND HOLES



BY USING a Bokum single point (Style C), internal threading tool, you can produce threads clear to the bottom of blind holes. The shank being in line with the cutting edge of tool, the angles of all the threads are perfectly true. Sharpening is done on only one face without disturbing or changing the angle. No other tool like it.

Bokum tools of the same type are also available for general boring (Style A), and for bottoming and facing (Style B).

Ask for Catalog A-1139 for Super High Speed Tools, and for A-398 for Carbide Tipped Tools.

BOKUM TOOL CO.
14775 WILDEMERE AVE. · DETROIT 21, MICH.

AN *All-Electric* ADJUSTABLE-SPEED DRIVE FOR A-C. CIRCUITS

SPEED RANGES up to 16 to 1 — SIZES 1 TO 30 hp.

SPEED CHANGES. Speed adjusted smoothly over a wide range while machine is in operation.

QUICK STOPPING. Obtained electrically from speed adjuster handle or stop button.

SLOW FOR THREADING and INCHING. Safe for setting-up and for close inspection in process.

SMOOTH ACCELERATION. No clutches. Smooth acceleration and deceleration to protect light material in motion.

ALSO: A direct space-saving drive; speed-control convenience without limitations; reversing; start and stop without interfering with speed setting; ample starting torque.

Send for your copy of Bulletin 311 — FREE

RELIANCE ELECTRIC & ENGINEERING CO.
1088 IVANHOE ROAD — CLEVELAND, OHIO
Sales Offices in Principal Cities

Hanna "tip-toe" action *foot operated* Valves

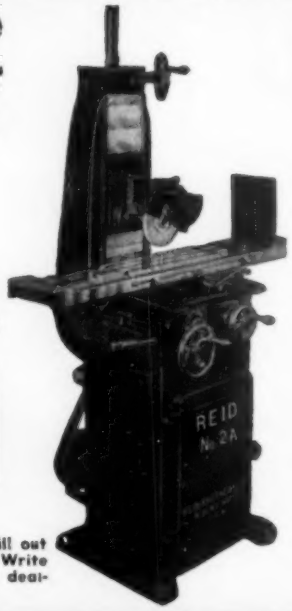
• Hanna Foot Operated Valves leave both hands free for full-time use in holding work, feeding and removing pieces, or for any other advantage that an "extra" hand can give to an operation. Foot Control with Hanna Valves can help speed production through increased operator efficiency. Operator fatigue is reduced by this effortless "tip-toe" action: the treadle when depressed is but 1-5/8" from the floor and 2-1/8" in its "up" position—a movement of only 1/2" is required for operation.

Hanna Foot Valves are available in 3/8" and 1/2" pipe sizes. Use them for your controls and free busy hands for full-time work.

Send for the Hanna Valve Bulletin.

HANNA ENGINEERING WORKS
1765 ELSTON AVENUE • CHICAGO 22, ILLINOIS
RIVETERS • CYLINDERS • VALVES • AIR HOISTS

REID Automatic Feed Surface Grinder No. 2A



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A Proven Product for Over a Quarter Century with Thousands in Use Daily

Our dealers will help you fill out necessary priority form. Write us today for your nearest dealer's name and address.

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387 CHARLES ST. PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World

THE IMPROVED NIELSEN LIVE CENTERS

★

Load capacity 200 to 40,000 lbs. at 100 rpm

Have adjustment to take up wear and preload bearings

•

Standard Morse Taper No. 2 to 6 in stock

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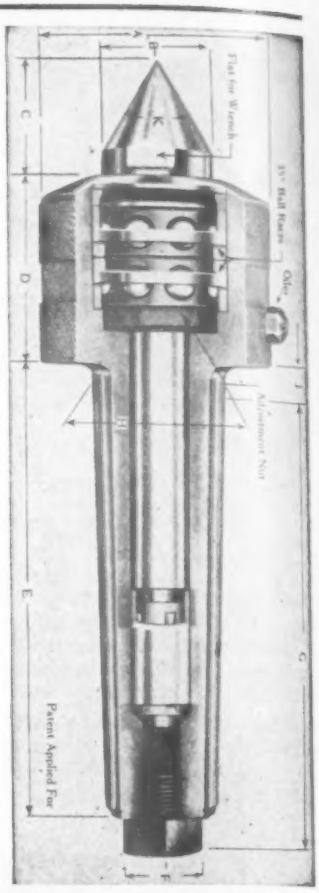

NIELSEN INCORPORATED

LAWTON • MICH.

In War, as in Peace . . .

CERRO ALLOYS

SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

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40 WALL STREET - - NEW YORK 5, N. Y.

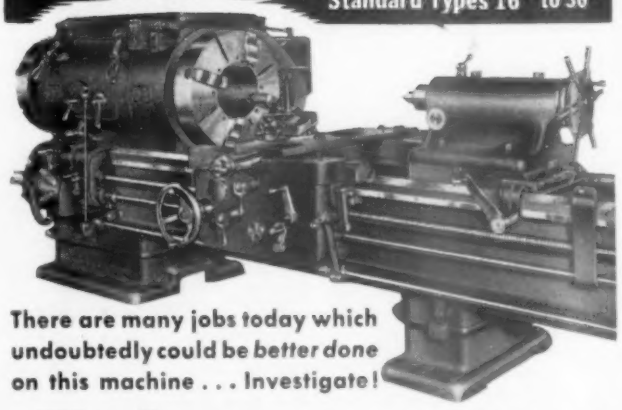
Hydratrol Lathes

LARGE HOLLOW SPINDLE TYPE

Increase Production, Improve Work, Save Man-Power and Materials!

FIVE SIZES—18" to 36"

Standard Types 16" to 36"



There are many jobs today which undoubtedly could be *better done* on this machine . . . Investigate!

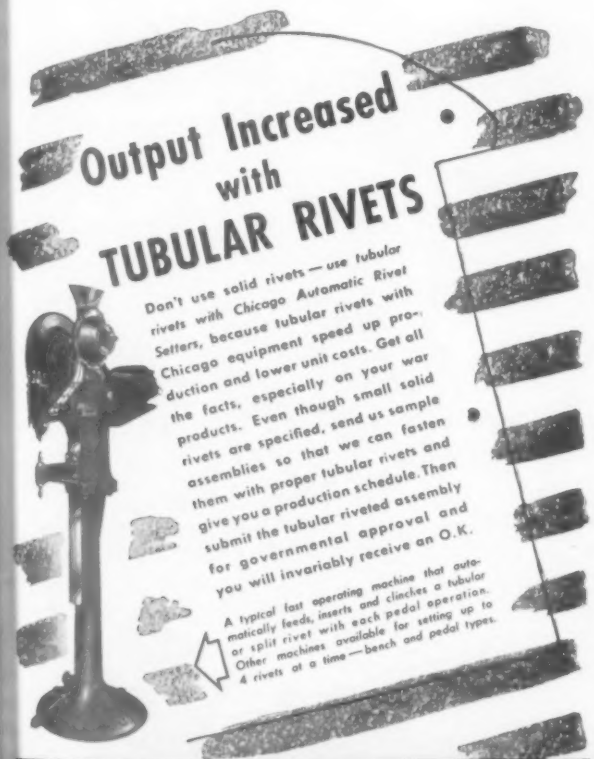
Lehmann MACHINE CO.

CHOUTEAU AT GRAND ★ ST. LOUIS 3

CHASE THREADS TRUE & STRAIGHT WITH THE RIEGER DIE HOLDER

This useful tool is needed in every machine shop. It's built to hold 1" or 1½" O. D. button dies for chasing threads up to ⅝" x 3" in a lathe or drill press. Whether you have a single piece to thread or a quantity of them, you can do the work faster and better with the Rieger Die Holder. And you don't have to wait! *We have on hand ready to ship immediately* a supply of Model DH-1512-MT with No. 2 Morse taper shank. Write for literature and quotation.

THE RIEGER MFG. CO.
DEPT. TE-9 MIAMISBURG, OHIO

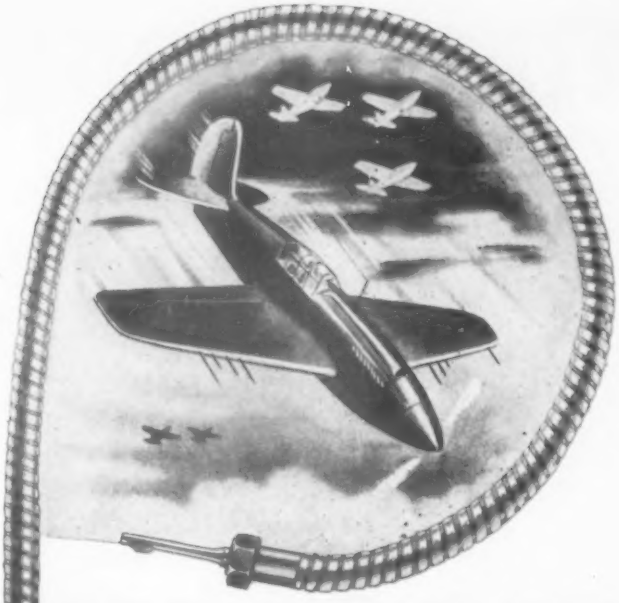


Output Increased with TUBULAR RIVETS

Don't use solid rivets — use tubular rivets with Chicago Automatic Rivet Setters, because tubular rivets with Chicago equipment speed up production and lower unit costs. Get all the facts, especially on your war products. Even though small solid rivets are specified, send us sample assemblies so that we can fasten them with proper tubular rivets and give you a production schedule. Then submit the tubular riveted assembly for governmental approval and you will invariably receive an O.K.

A typical fast operating machine that automatically feeds, inserts and clinches a tubular or split rivet with each pedal operation. Other machines available for setting up to 4 rivets at a time — bench and pedal types.

Chicago Rivet AND MACHINE CO.
9622 W. JACKSON BLVD., BELLWOOD, ILL. (Chicago Suburb)
TUBULAR AND SPLIT RIVETS IN ALL RIVET METALS



WHEN THE "LONGEST WAY 'ROUND IS THE SHORTEST WAY HOME"... Specify Walker-Turner Flexible Shafting

In transmitting light power loads between two points, it is often possible to design a simpler, lighter, more compact product with Flexible Shafting than with gears.

You'll find, too, that it pays to specify Walker-Turner Flexible Shafting on jobs like these — for smoother power flow, more sensitive control, trouble-free operation. Into this product, we've packed all the "know-how" picked up in years of manufacturing our own flexible shaft machines . . . in years of working with other manufacturers on problems of power transmission and remote control. Let us know if we can put that experience to work for you!

WALKER - TURNER COMPANY, INC.
Plainfield • New Jersey

walker-Turner
FLEXIBLE SHAFTING
FOR REMOTE CONTROL AND POWER TRANSMISSION
6-11

CENTER REAMERS
HIGH SPEED

45, 60, 82 and 90 DEGREES

IMMEDIATE DELIVERY

SIZE	LGTH OVERAL	SHANK DIA	LGTH SHANK	OUR NET PRICE
1/4	19/16	3/16	3/4	$ .80
3/8	2	1/4	7/8	.92
1/2	2 1/16	3/8	7/8	1.13
5/8	2 5/16	3/8	7/8	1.40
3/4	2 3/4	1/2	1 1/4	1.75
1	3	1/2	1 1/2	3.50

●

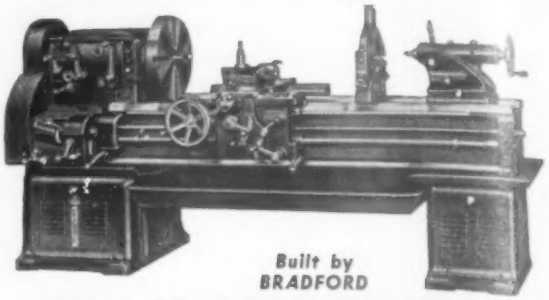
Victor Machinery Exchange, Inc.

251 Centre Street • New York, N. Y.

Phone: CAnal 6-5575

SEND FOR OUR CIRCULARS

Metalmaster Lathe



Built by ***BRADFORD***

BUY A BRADFORD FOR QUALITY

★ Dollars are saved with this top-notch lathe. Low production costs, smooth operation, continuous accuracy are all assured because the Metalmaster's design is right!

★ Among its many features are 12 speeds in both forward and reverse. Get full details in our literature.

1840 - 1944

Bradford's experience in building metal-working machinery covers more than a century.

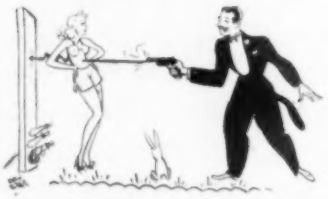
Also manufacturers of drilling and tapping equipment

THE BRADFORD MACHINE TOOL CO.

EVANS STREET SOUTH OF EIGHTH CINCINNATI, OHIO

PRECISION TOOLS SINCE 1840

IT'S NO TRICK AT ALL WITH TORIT



TORIT DUST COLLECTORS

The reason why it is no trick with Torit to eliminate dust in all shops where grinding, cutting, and polishing wheels are used, is because they are compact, portable, self-contained units.

Torit Dust Collectors are adaptable to present or future production layouts. In one operation they trap dust and re-circulate clean air into the room. They protect machinery, speed production, and safeguard employees' health. For complete information write:

TORIT MANUFACTURING COMPANY
281 Walnut St.
St. Paul 2 Minn.

TORIT
Dust Collectors
SELF-CONTAINED UNITS

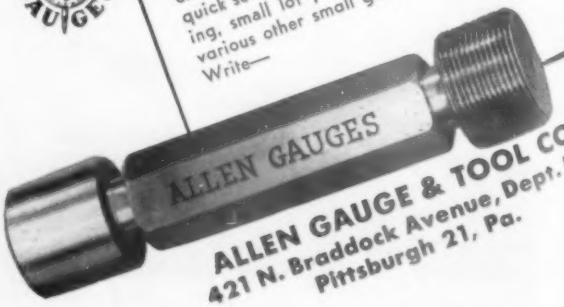
Prompt Delivery

Precision Ground THREAD PLUG and RING GAUGES PROVE YOUR PRODUCT!

With ALLEN GAUGES of all types—pro-file — length — flat — flush pin — snap — limit.

Also prompt delivery on special gauges for Ordnance Departments, plain plug & ring gauges, special jigs, fixtures and machinery. Send us prints for quotations and quick service on production thread grinding, small lot production machining and various other small gauges and products. Write—

ALLEN GAUGES

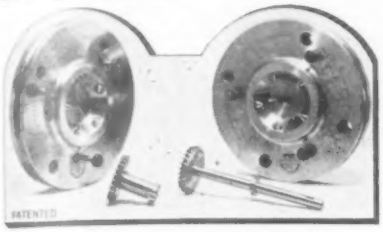


ALLEN GAUGE & TOOL CO.
421 N. Braddock Avenue, Dept. E.T.
Pittsburgh 21, Pa.

GARRISON GEAR CHUCKS

are used on:

Gear Shapers . . . Drill Presses . . . Engine Lathes . . . Turret Lathes . . . Internal Grinders . . . External Grinders . . . Gear Tooth Grinders . . . Oscillating Grinders . . . Diamond Boring Machines . . . Horizontal Boring Machines.



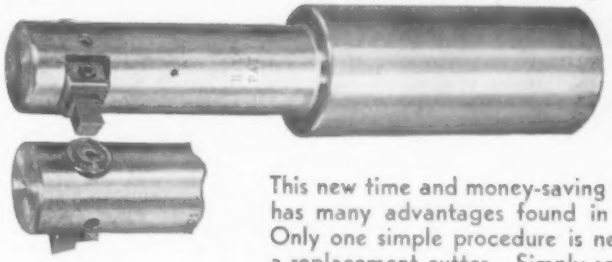
and are used for:

Grinding, Machining, Precision Boring and other operations on Spur, Internal, Bevel, Cluster, Helical and Herringbone Gears.

GARRISON MACHINE WORKS, Inc.
DAYTON 7, OHIO

NEW NASH-ZEMPEL BORING BAR INSERT

Micrometer-Adjustable



SHORT PIECES OF SCRAP TOOL BITS MAY BE USED AS REPLACEMENT CUTTERS

This new time and money-saving boring bar insert has many advantages found in no other insert. Only one simple procedure is necessary to make a replacement cutter. Simply square up the cutter stock to fit the square hole in the insert. No special tools necessary.

The insert can be installed on any bar available by a simple boring and milling operation. The locating head of the boring bar insert fits snugly into the recessed slot of the bar. The set screw in the boring bar locates the insert and draws the head firmly against the shoulder of the recessed slot in the bar. Accurate location point is always maintained.

Write at once for complete, descriptive bulletin

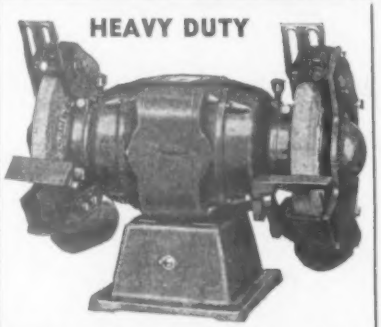
NASH-ZEMPEL TOOLS

Division of J. M. Nash Company

2363 NORTH 30TH ST. MILWAUKEE 10, WIS.

BALDOR BALL BEARING GRINDERS

HEAVY DUTY



BUILT FOR HEAVY PRODUCTION SERVICE

BALDOR Grinder No. 101—built for the heavier production jobs. 1½ hp., ball-bearing motor; 1725 r.p.m., 220, 3-phase, 60-cycle. 10" x 1" Aloxite wheels, exhaust type guards and adjustable tool rests. **$90.00**

Ask for **Bulletin 319**

Baldor Electric Company

4335 Duncan Ave., St. Louis 10, Mo.

BUILT BY MOTOR SPECIALISTS

Talk About PRODUCTION Without DIES!

4,000 Parts Per Day with DI-ACRO Bender

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines,—Benders, Brakes, Shears. Picture below shows an acute right angle bend and photograph above shows the finished part formed to die precision. Women operating DI-ACRO units maintain a high out-put on production work.

"Enclosed pictures in our plant prove the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on request)

Send for CATALOG

showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING."

"DIE-LESS" DUPLICATING
The DI-ACRO System of METAL DUPLICATING Without Dies
DI-ACRO
DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

307 EIGHTH AVENUE SOUTH · MINNEAPOLIS 15, MINNESOTA

THE PASSING PARADE

T M. REG. BY THE BRAMSON PUBLISHING COMPANY

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Charles L. Saunders, former Vice President of Minneapolis-Honeywell Regulator Company, becomes Vice President of Wheelco Instruments Company. He resigned as Branch Chief of the War Production Board's Office of Civilian Requirements. A graduate of Virginia University, Saunders had also worked for Brown Instrument before that firm was absorbed by Minneapolis-Honeywell.

Nationally prominent in tool steel circles, **Arthur M. Morgan,** a vice president of Latrobe Electric Steel Company, has been elected to a director of his company. He has served his firm 15 years.

William C. Seccombe has been chosen to head George William Finegan, Inc., a sales and service organization. He has been associated with the firm for many years.

Perry D. Helser has been selected Secretary-Director of the newly-organized Magnesium Association. Helser was formerly Chief of the Magnesium Branch of the War Production Board. Membership of the association consists of producers, fabricators, smelters and consumers of magnesium. Purpose will be to develop and increase use of the light metal and its products. Other officers include: **E. S. Christiansen,** Apex Smelting Company; **C. C. Loomis,** New England Lime Company and **C. E. Larson,** White Metal Rolling & Stamping Corporation.

D. E. Williamson

P. D. Helser

The University of Michigan reports appointment of **D. E. Williamson** of Ann Arbor as Research Engineer. He resigned as Senior Staff member of Profilometer Division of Physicist's Research Company, with which he has been associated since 1936. He will work with **Dr. H. R. Crane.**

L. S. Starrett Company announces appointment of **Carlton S. Phillips** as New York Manager. He became associated with Starrett in 1912 after serving an apprenticeship with the Fitchburg Steam Engine Company.

Increasing research to further the war effort and to engineer products for post war sales led the Ilg Electric Ventilating Company to make several important personnel changes. **Frank P. Bleier** has been named Director of the Research Laboratory. **Raymond V. Pfautsch,** formerly Product Design Engineer, assumes title as Assistant Chief Engineer and will devote his time to product development and manufacture. **Richard Hanford** becomes Electrical Engineer, **A. J. Lenke** will be Production Manager and **George Biggott** has been placed in charge of Production Planning and Scheduling.

Important personnel shifts at Cleveland Automatic Machine Company have been revealed. **John J. Prochaska** has been named General Sales Manager to succeed **George A. Collier,** resigned. **V. J. Hannon** was promoted to Cleveland District Manager.

(Continued on page 218)

INVENTIVENESS CRAFTSMANSHIP and EXPERIENCE

in designing and building special machines and parts

• "That man is most original," said a famous philosopher, "who can adapt from the greatest number of sources."

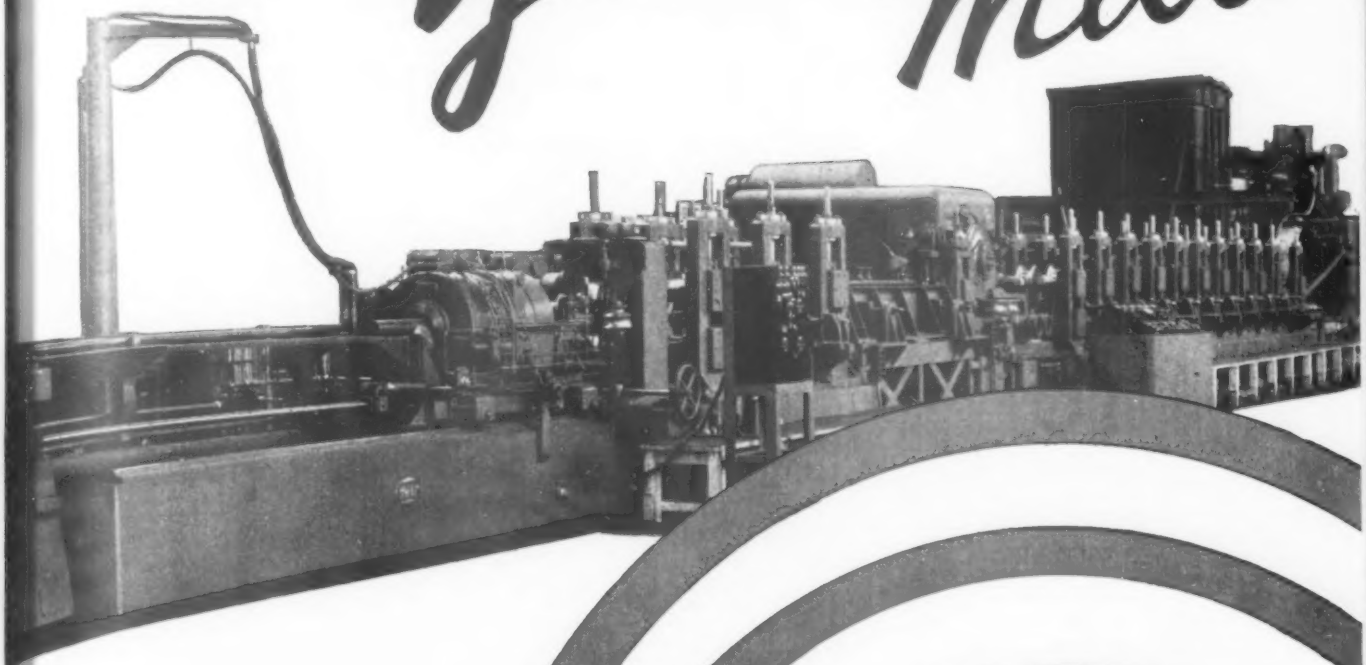
Operating on this principle, MERZ has not limited the scope of its work to a few standardized items, but serves many industries, designing and manufacturing all types of experimental and "pilot model" equipment, special parts, tools, gages and fixtures of most intricate and complicated designs. Tell us what you need, and get our suggestions.

MERZ standard plug and ring gages, of guaranteed accuracy, and in most wanted sizes, are carried in stock for prompt shipment. Literature mailed on request.

MERZ *Engineering Company*

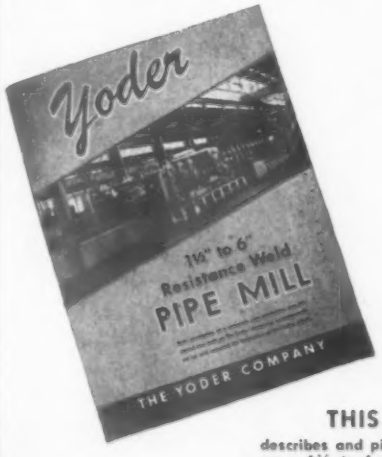
INDIANAPOLIS 7, INDIANA

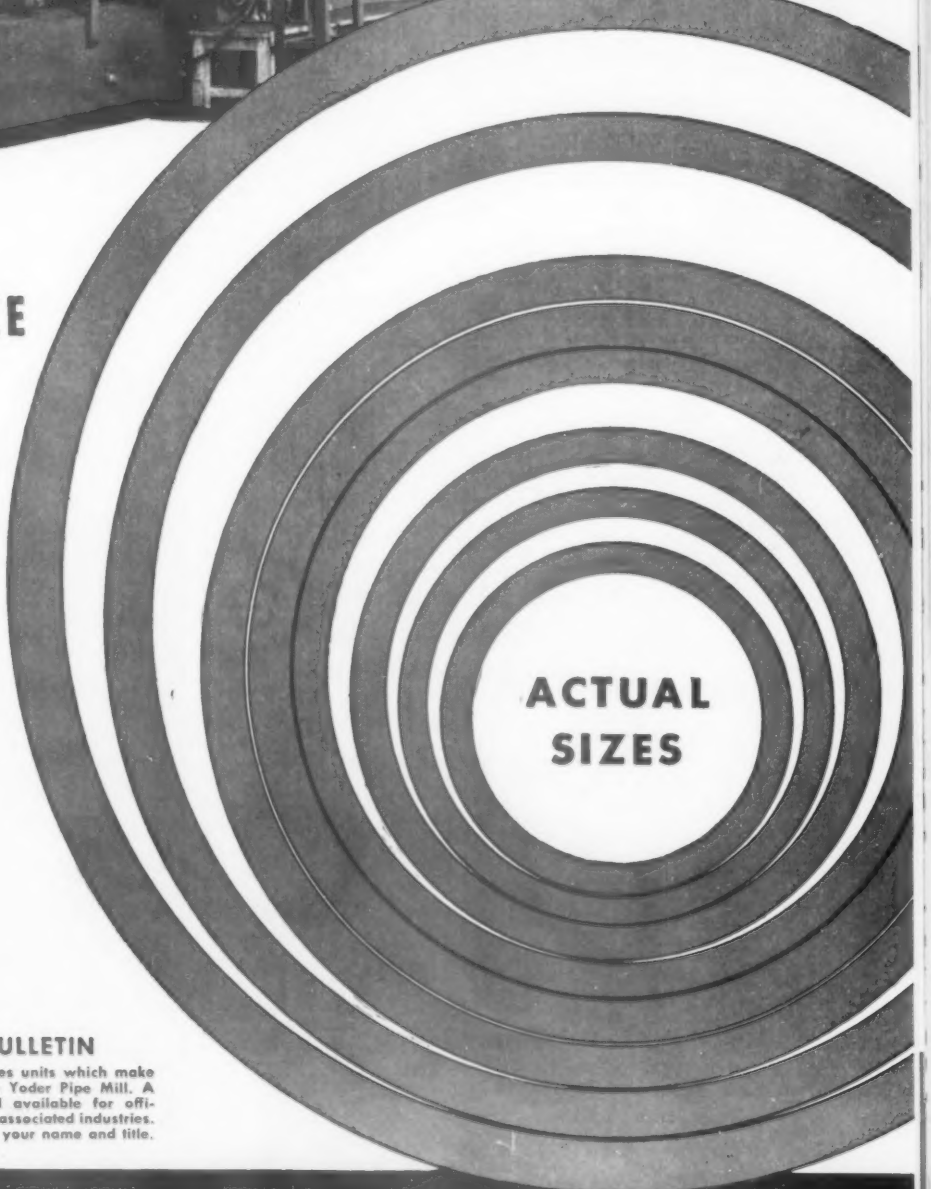
This Yoder Mill



MAKES RESISTANCE WELD STEEL PIPE OR TUBE IN THESE SIZES

from continuous strip stock





THIS BULLETIN

describes and pictures units which make up a 1½ to 6 inch Yoder Pipe Mill. A limited number still available for officials or engineers of associated industries. Please write, giving your name and title.

THE YODER COMPANY

Machinery for Metal Manufacture

5500 WALWORTH AVENUE • CLEVELAND 2, OHIO

Appointment of **Elmer W. Pfeil** as Vice President and General Manager is announced by Anker-Holth. Pfeil started with Bourne & Fuller which later became part of Republic Steel. In the latter corporation he managed salvage and reclamation and expediting department.

Metallurgist **Dr. Walter M. Mitchell** has been named Research Director for Mack Trucks, Inc., according to announcement of **L. C. Josephs,** Engineering Vice President. Graduate of Pennsylvania and Princeton, Dr. Mitchell has had responsible posts with York Safe and Lock Company, Carnegie Illinois Steel, Republic Steel and E. I. dul'ont de Nemours. While with the latter firm he pioneered use of stainless steel in nitric acid plants.

Added duties have been handed to **L. T. Willison** of Jones & Laughlin Steel Corporation. Already Manager of Ordnance Sales, he will serve as Manager of Cold Finished Sales. He succeeds **C. F. Goldcamp,** resigned. Willison joined his firm in 1927, and has since held a number of positions. He became Manager of the Ordnance Sales when it was created in 1942.

Advancement **of Walter H. Ellis,** former Chief Sales Engineer for Logansport Machine Company is announced. Ellis is now associated with Compressed Air Products, sales representative for Logansport.

Arthur Gordon Green has been appointed Sales Manager of Bay State Abrasive Products Company, according to a recent announcement. He had been with Norton Company 28 years in various capacities. In his new post, Green will have charge of sales, warehouse personnel and distributor relations.

A. G. Green

W. J. Priestley

Union Carbide and Carbon's **William J. Priestley** has been elected President of Electro Metallurgical, Michigan Northern Power and two Canadian corporation units. Advocate of stainless and alloy steels, Priestley was graduated from Lehigh U. to join Bethlehem Steel. During World War I he headed Armor Plate and Ordnance, U. S. Navy. He joined Electro Metallurgical in 1923. Priestley was Chief of the Alloy Steel Division of the War Production Board in 1942.

Election of **George M. Tisdale** as a vice president of United States Rubber made room for promotion of **Stanley W. MacKenzie** to Director of Purchases. MacKenzie attended Michigan State College, leaving to serve in World War I as infantry officer. He joined U. S. Rubber in 1920 and has held several positions since. He has been Assistant Purchasing Director since 1941.

Postwar planning at Reliance Electric & Engineering Company has brought several important personnel changes. Establishment of a Sales Promotion Department is announced by **James W. Corey,** Sales Vice President. **Roscoe H. Smith,** who has managed Applied Engineering, will head the new division, assisted by **Kenneth F. Ertell,** Assistant Advertising Manager.

Under the enlarged set-up, **C. V. Putnam** will relinquish advertising duties to Smith and will continue as Secretary of the company. **Richard A. Geuder,** until recently Manager of Metal Industry applications, will become Manager of Applied Engineering. He will be assisted by **John L. VanNort,** formerly of Salt Lake City, and **William C. Madsen,** who has been Application Engineering Staff Member three years. **Paul W. Arnold** will continue as Manager of Machine Design Applications.

Westinghouse announces three appointments of interest. **A. Morton Cooper** has been promoted to manage

(Continued on page 220)

For Precision Boring — Universal
MIKRO-LOK Boring Bars
You can Depend on
Micrometer Graduations
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For finishing cuts with extreme accuracy. Extremely rigid. Easily and quickly adjusted like a micrometer to within .0005. All standard type shanks available. Singly or in sets. Write for catalog.
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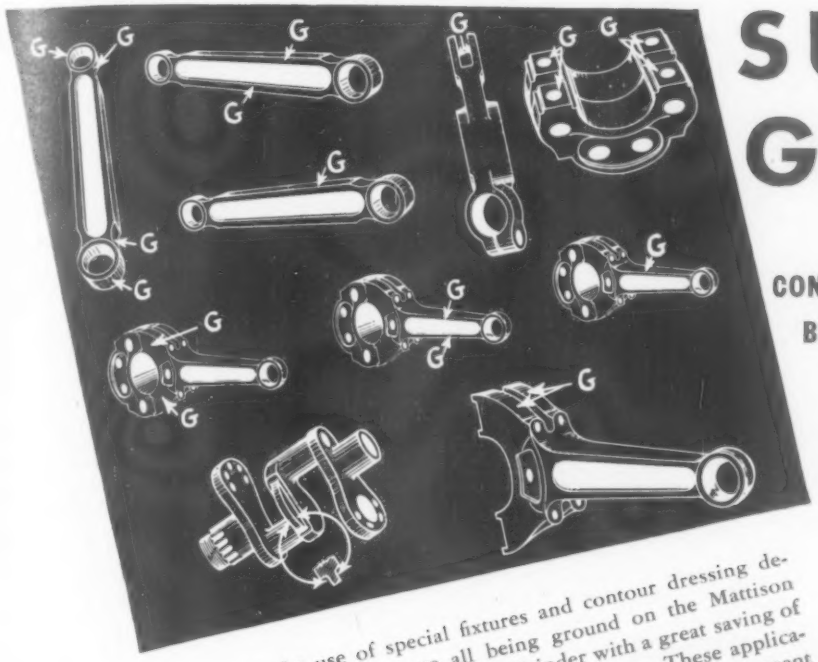
WIDE RANGE OF FORM WORK NOW BEING GROUND ON MATTISON SURFACE GRINDERS



· A FEW EXAMPLES ·

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BEARING CAPS—CRANKSHAFTS

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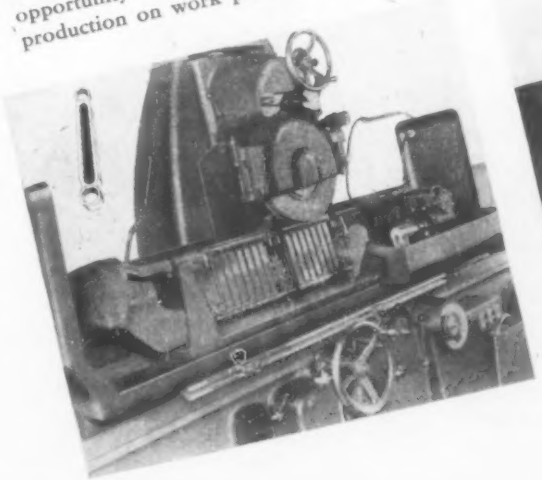
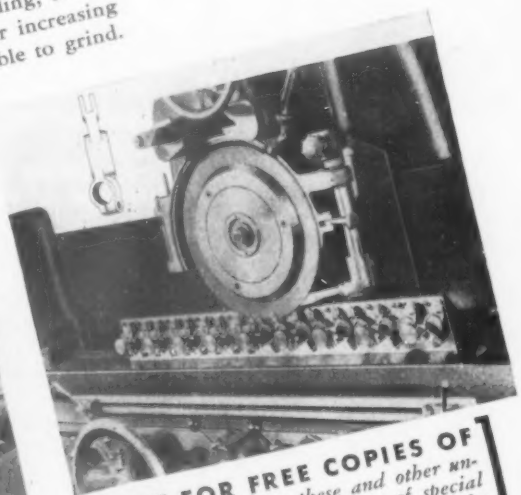
Through the use of special fixtures and contour dressing devices the above parts are all being ground on the Mattison High-Powered Precision Surface Grinder with a great saving of time and to extremely close limits of accuracy. These applications are important, not only from the standpoint of present production needs, but because they illustrate the unlimited capacity of Mattison Grinders over and above regular flat grinding. To you it opens up a new opportunity for grinding, a new opportunity for saving and a new opportunity for increasing production on work previously thought impossible to grind.





ASK FOR FREE COPIES OF *literature showing these and other unusual jobs ground by means of special fixtures and dressing devices on the Mattison Grinder.*

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

the General Mill Section of the company's Industrial Department, according to **C. B. Stainback,** manager. Cooper started with the firm in 1920 and in 1929 became a salesman. He transferred to the General Mills Section in 1942.

Frank E. Bodine, Utah-Idaho representative for the Westinghouse Electric & Manufacturing Company since 1928 and Salt Lake City office manager since 1941, has been transferred to manage the San Francisco office, it is reported by **Chas. A. Dostal,** Vice President in charge of the Pacific Coast District. Bodine is a graduate of Colorado State College and is currently president of Electrical League of Utah.

R. T. Muench will manage the X-Ray products Department of Westinghouse, according to **W. B. Turnbull,** Manager of the Agency and Specialties Department. Muench attended Missouri University and Missouri School of Mines. He joined Westinghouse in 1935. Prior experience includes the United States Engineers, Dick X-Ray Company, Engeln X-Ray Company and Bauer & Black.

Haynes Stellite Co. announces election of **E. E. LeVan** as President. The firm is a Union Carbide and Carbon Corporation unit. The new president was graduated from Pennsylvania State and has since been identified continuously with the metals industry. Following five years with Bethlehem Steel, he joined Haynes Stellite as sales engineer. LeVan held various posts and in 1939 was elected Vice President. He was named General Manager and a company director May 22, 1944.

Anticipating expanded use of resistance welding in the post war world, Progressive Welder Company is engaged in strengthening its sales staff, according to **Fred Johnson,** President.

E. J. DelVecchio

Harry S. Rose

Two important appointments have been announced. **E. J. DelVecchio,** formerly associated with Taylor-Winfield Company has been named Field Sales Manager. At the same time **Harry S. Rose,** formerly Chief Sales Engineer, has been shifted to position of Sales Manager for the Detroit district. Rose will have added responsibility in application planning.

Appointment of **Frank Lau** as Director of Industrial Relations of Willys-Overland Motors has been announced by **William E. Paris,** Manufacturing Operating Manager. Lau started with the automobile firm in 1909 as messenger. He has headed various factory offices and until his promotion was Supervisor of Factory Accounting.

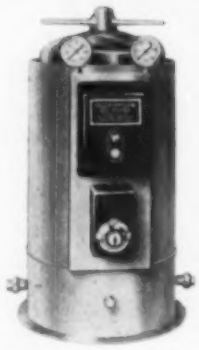
Professional honors went to two members of the Controllers Institute of America in recent elections. **Raymond L. Bischoff,** Treasurer and Assistant Secretary of Kearney & Trecker Corporation, has been selected Secretary-Treasurer of the Milwaukee Control. **O. J. Norris,** Assistant Treasurer of Ross Gear and Tool Company, was inducted into the office of Vice President of the Indianapolis Control. Both organizations are affiliated with the national order, devoted to improvement of controllership procedure.

From Sales and Service Representative for Kelly-Koett Manufacturing Company Major **William L. Hansen** jumped to supervisor of a North African medical supply depot. Hansen served in England before going to Africa. His depot distributes dental, medical, surgical and optical supplies in the Mediterranean war theater.

Long-time executive **Thomas P. Archer** has been named General Manager of Fisher Body Division of General Motors. He joined GM in 1919 and a year later was named Superintendent of Ternstedt Division. He became General Manager in 1925 and in 1934 transferred to Fisher Body. He was

(Concluded on page 222)

FOR INDUSTRIAL OIL PURIFYING
Specify HILCO
HYFLOW OIL FILTERS



HILCO Hyflow Oil Filters are used for filtering all types of industrial oils such as used for cutting and lubricating. Units are available for stationary use or portable operation for moving from one machine tool to another.

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Priced from $9.75 up

"Our Trico Micro-Cheks hold close tolerances on parts turned on lathes – especially where machine is of light construction and the operator may apply so much pressure against the lathe stops that the piece is turned too small," says the F. A. Smith Manufacturing Company, Inc., of Rochester, N. Y." In these situations, the Micro-Chek is a visual aid to the stop. The results are quick, positive operations and a low rejection rate . . . Very useful where inexperienced operators must be employed . . . sturdy, easy-to-read . . . register accurately."

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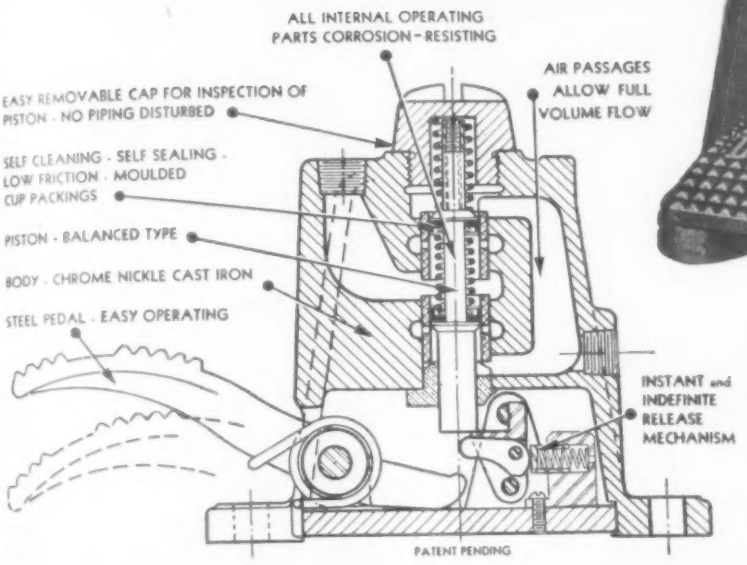
"LOGAN" Air CONTROL VALVES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AIR PASSAGES ALLOW FULL VOLUME FLOW
EASY REMOVABLE CAP FOR INSPECTION OF PISTON - NO PIPING DISTURBED
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INSTANT and INDEFINITE RELEASE MECHANISM
PATENT PENDING

On operations where both hands are needed for chucking the work piece, LOGAN foot valves speed up production. Model 6520 single pedal foot valve, shown here, can be set to give either instant or indefinite release. This dual purpose valve eliminates the need for two types of foot valves. The valve is self-cleaning, the moulded cup packings are self-sealing, and all internal operating parts are corrosion resistant.

For long life and Trouble-Free Service

MODEL TL
Plug Type
Hand Control Valve

This hand operated valve has no packings, assuring a leak-proof valve with practically no maintenance cost. All working parts may be removed without disconnecting any of the pipe lines.

The two air valves illustrated here are typical examples of the simplicity of design and sturdy, precision construction for which all "LOGAN" valves are outstanding. This design and construction insure ease of operation, long life and trouble-free service.

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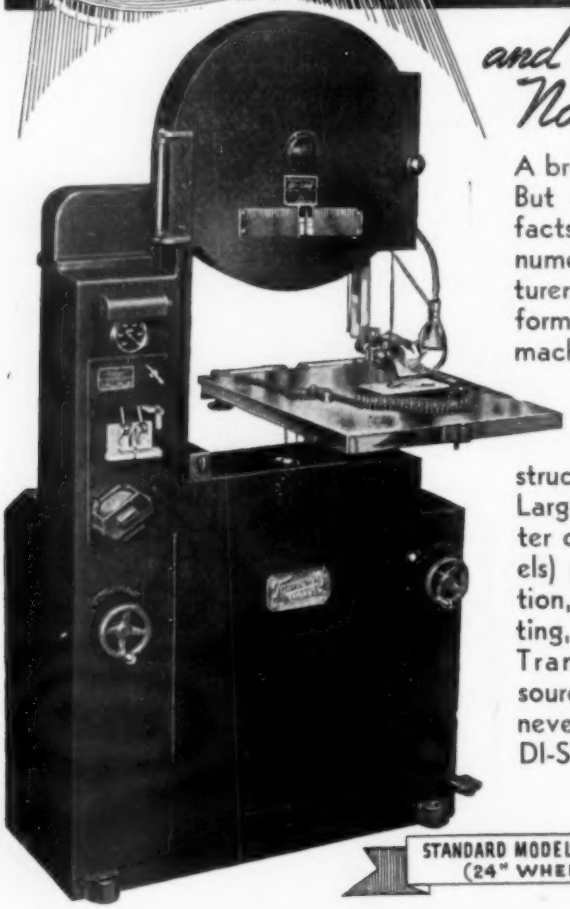
INVESTIGATE Tannewitz DI-SAWS

and You'll Want No Other!



A broad statement? Yes. But soundly founded on facts—the experience of numerous large manufacturers — the actual performance records of the machines, themselves — and fundamental superiorities of design and construction.

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THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

—PASSING PARADE—

elevated to Vice President in charge of Operations in 1934. In 1941 Archer was appointed Assistant General Manager and in 1943 was elected a GM Vice President.

Once Michigan Bar Association President, **Glenn C. Gillespie** has been elected a director of National Tool Company. Judge Gillespie has been Pontiac City Attorney and Oakland County Prosecutor. In 1921 he became a Circuit Judge and served 15 years. He had been an active officer in the consulting engineering firm of A. J. Brandt Company.

Deaths

DR. TONE

Dr. Frank Jerome Tone, Chairman of the Board of The Carborundum Company, died July 26 after a lingering illness. He had been a pioneer in electrochemistry and electrometallurgy and had made fundamental contributions in both fields. He was a Cornell graduate and held University of Pittsburgh honorary degree as Doctor of Science. Dr. Tone had been honored with awards of scientific societies of many nations. Survivors include the widow, Gertrude Franchot Tone of Niagara Falls.

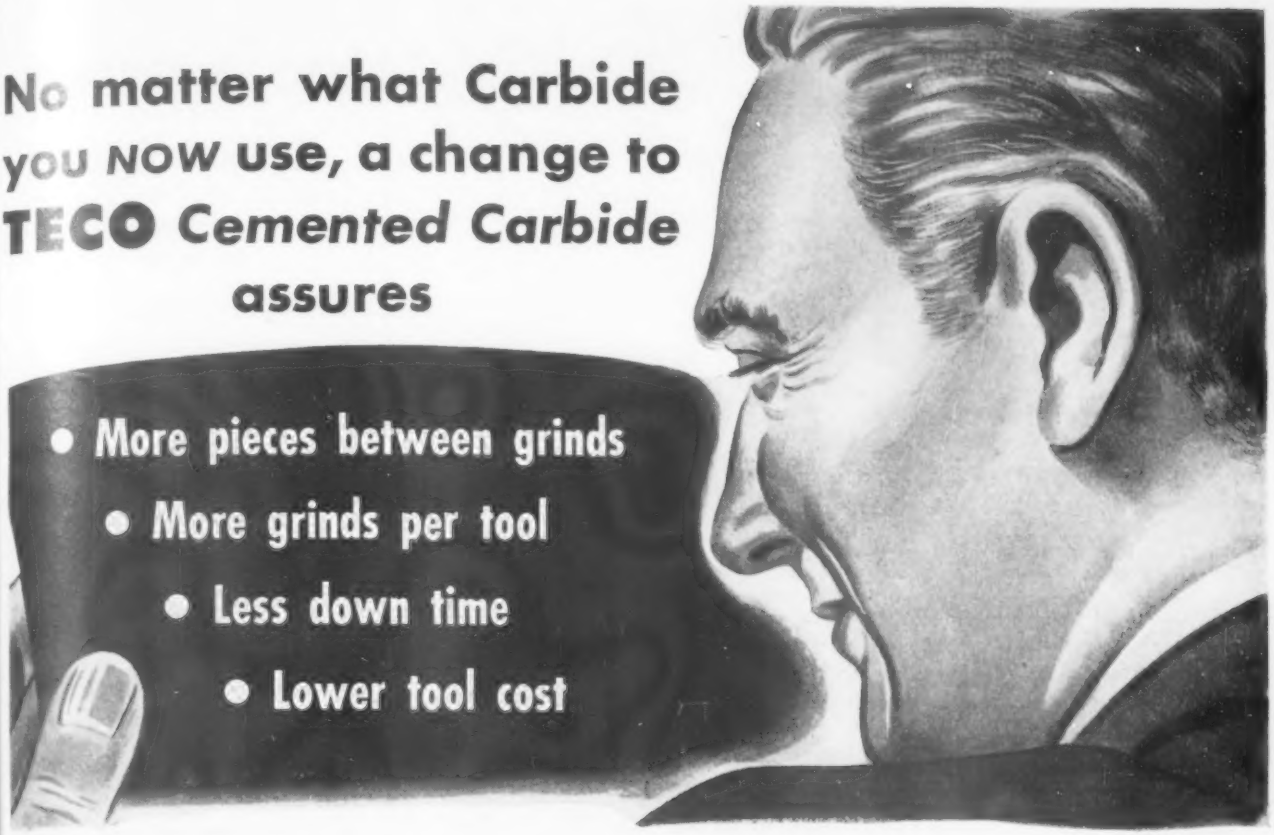
Robert E. Bell, from whom many top-flight production engineers took their early training, was killed in Detroit early in August in an automobile mishap. He was 65 years old and had been an instructor at the Henry Ford Trade School 28 years.

Arnold L. Scheuer, 66, former president of Kelly-Springfield Tire Company, died during July in New York.

Albert F. Sulzer died August 8 in Rochester, N. Y. He had been Vice Chairman of the Board of Directors of the Eastman Kodak Company. He was 65 years of age.

(Concluded on page 224)

No matter what Carbide YOU NOW use, a change to TECO Cemented Carbide assures



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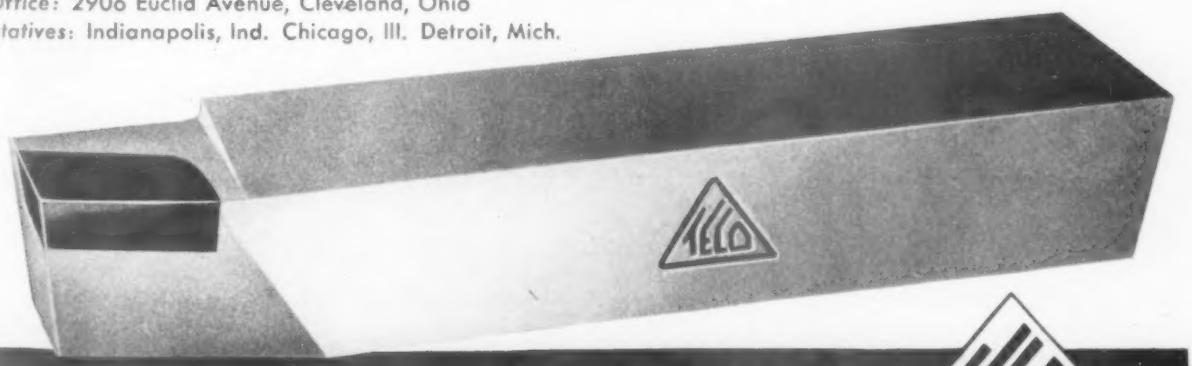

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A complete inspection department on wheels, to check parts right at the machine or bench. Errors are caught where they start and hundred of dollars in wasted man hours and material are saved.

The Unit consists of an 83-piece set of DoAll Gage Blocks, 20 auxiliary instruments, surface plate, Metron Comparator Gage, a file for records, desk space and collapsible seat. Occupies only 24 x 42" floor space.

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PASSING PARADE

Frederick C. Kroeger, 56, died last month in Indianapolis. He was former general manager of the Allison Division of General Motors Corporation.

Francis Patrick Gormely, 56, president of several units of Union Carbide and Carbon Corporation, died July 13.

Asthor E. Jacobson, 50, divisional controller of the Chevrolet Division of General Motors Corporation, died July 14.

Patrick H. Sullivan, retired assistant district manager of The American Car & Foundry Company, died July 13.

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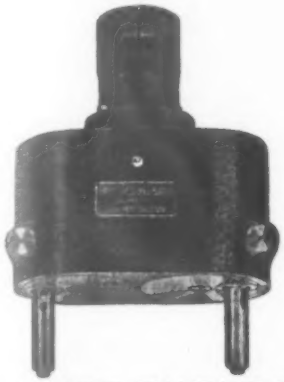

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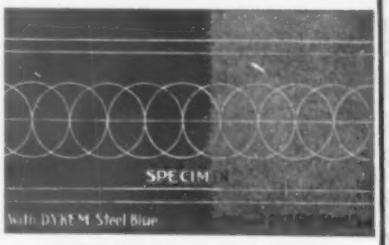

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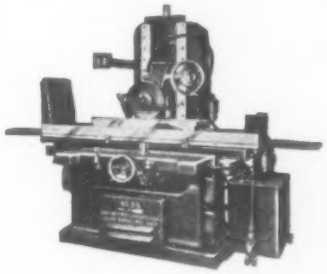

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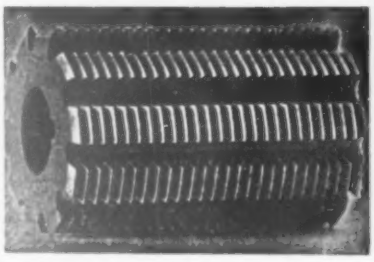

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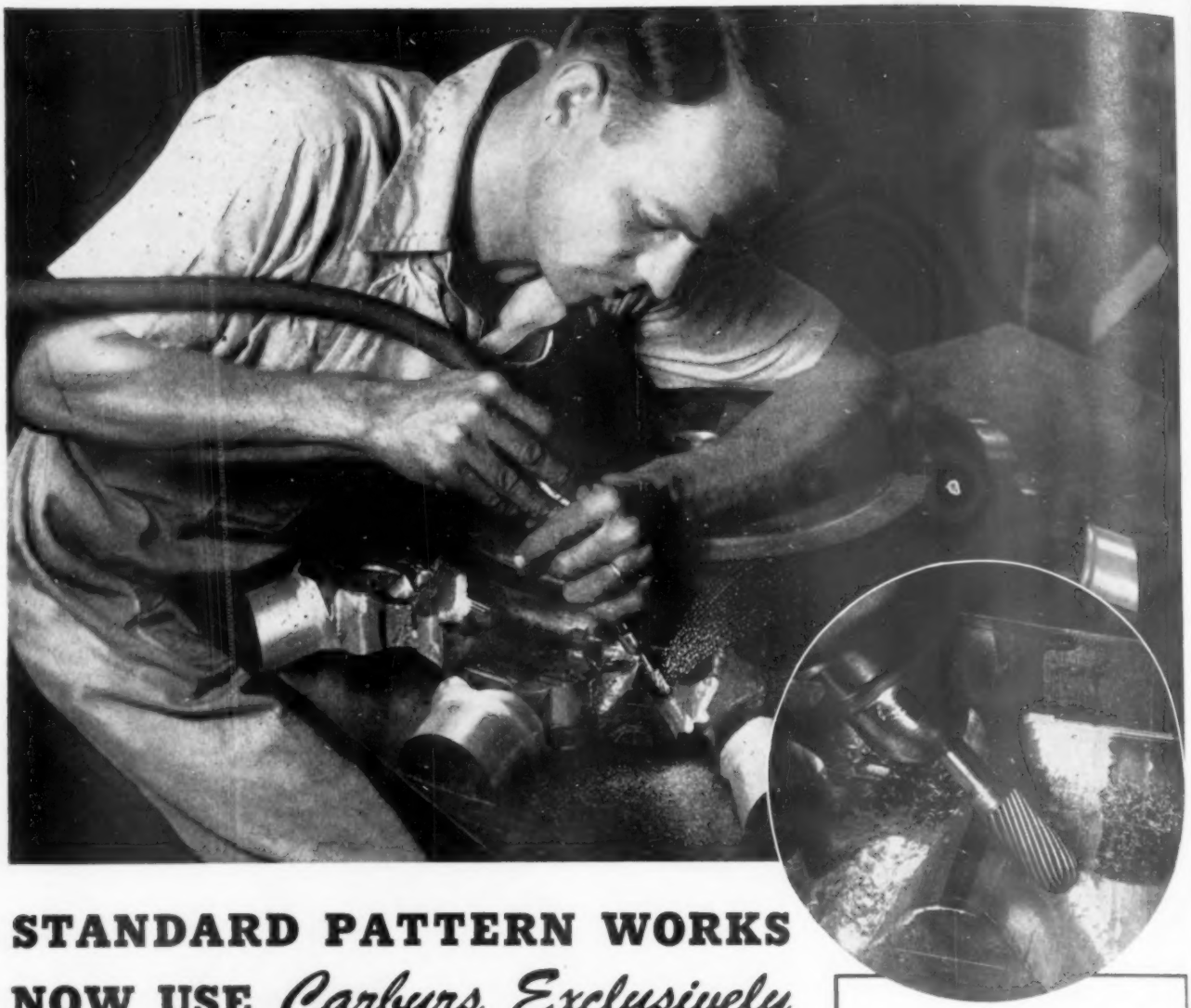

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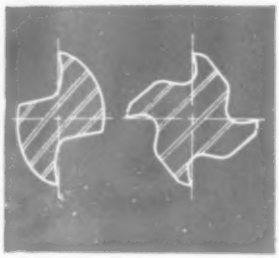

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